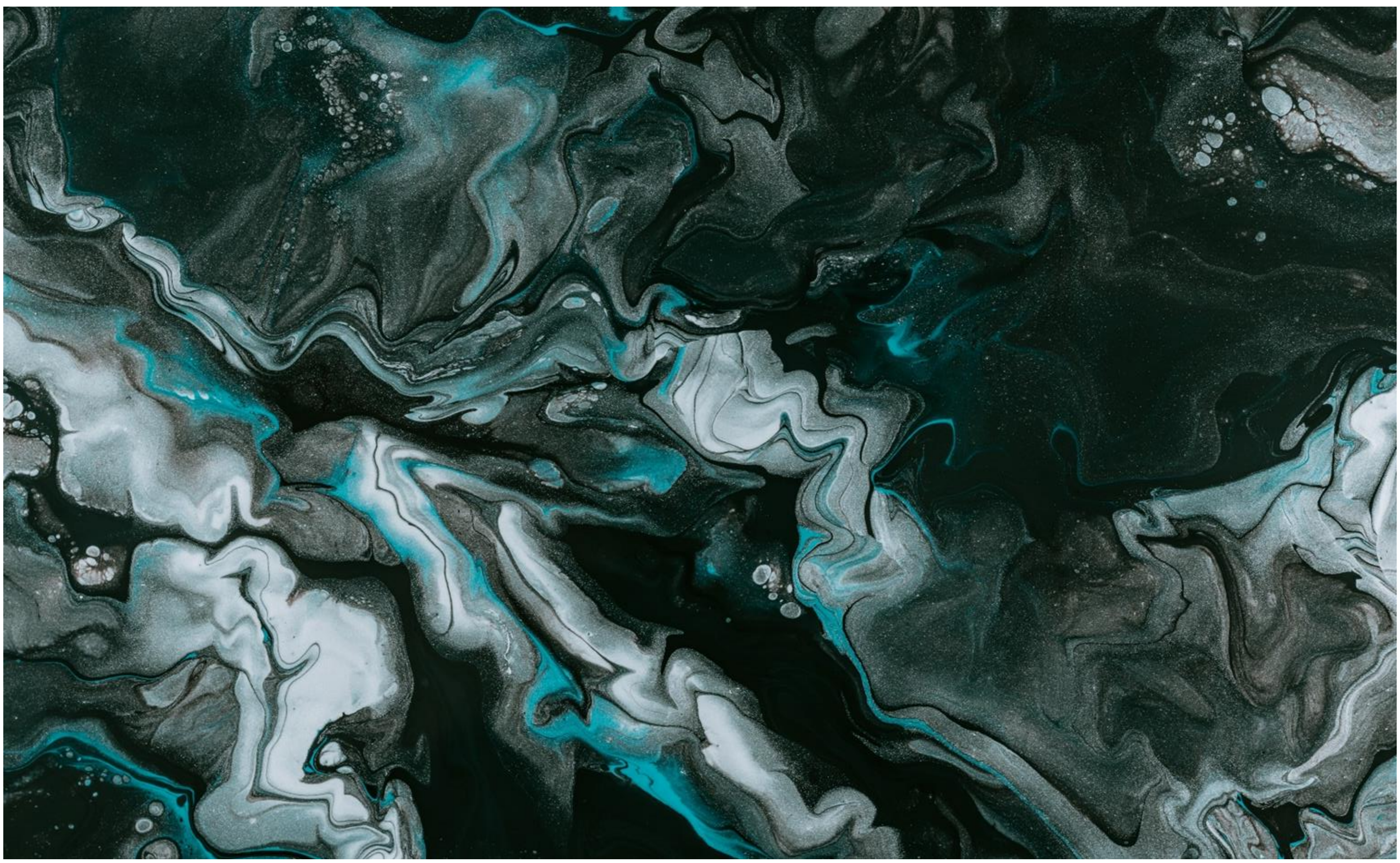
ROCKEFELLER
GLOBAL FAMILY OFFICE

2021

Rockefeller Insights

Capital Market Assumptions

10-Year Strategic and Longer-Term Secular Outlook for Asset Classes



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THE BIG PICTURE

At Rockefeller Global Family Office, we help our clients – ultra-high-net-worth and high-net-worth individuals and families, family offices, endowments, and foundations – design bespoke multi-asset portfolios based on their investment objectives.

To design an appropriate, thoughtful, and efficient investment portfolio, we begin by first exploring the true meanings of risk and reward to each individual investor. Based upon this understanding, we then apply a disciplined approach to our investment process through three stages that are intended to add value incrementally:

i. Setting a strategic asset allocation, the long-term foundation of an investment portfolio,

ii. Tactically tilting the asset allocation to capitalize on short-term opportunities that arise from the ebbs and flows of each market cycle,

iii. Bringing the asset allocation strategy to life through implementation with a calibrated blend of investment solutions.

While fluidity throughout the three stages is critical to maximizing the value creation potential of the portfolio construction process, empirical research (Brinson, Hood and Beebower 1995)[1] on the performance of pension portfolios has found that the risk contribution of investment policy (i.e., strategic asset allocation) dominates that of market timing and security selection, explaining roughly 95% of the total variance of portfolio performance. The return contribution of strategic asset allocation similarly dwarfs that of market timing and security selection.

The importance of strategic asset allocation is well researched and widely acknowledged. This gave rise to the practical applications of capital market assumptions.

For decades, long-term asset class return and volatility expectations have served as key inputs that inform investors' strategic asset allocation decisions (along with other statistical estimates such as correlations, tail dependency, and higher moments of probability distribution).

That, however, is not the primary purpose of this paper.

Our Philosophy and Approach

In our view, the traditional asset-class-based framework has a critical flaw. That is, this approach obscures investors' visibility on the underlying risk exposures of a portfolio. Subsequently, it may create the unintended outcome of under-diversification, which leads to greater portfolio vulnerability to macro risks.

As different asset classes often share common underlying return drivers, we believe that investors can improve the rigor and transparency of their portfolio construction approach by looking beyond the asset class perspective.

Specifically, we see great value in evaluating investment decisions through the lens of exposures to risk factors (e.g., growth, inflation, real yield, liquidity, volatility, etc.).

We believe that, by developing a logical understanding of the linkages between market pricing and fundamental macro forces, we can improve the quality of our probabilistic estimates of how asset classes may behave in various macro environments.

With such understanding, we are better equipped to construct high-quality, sophisticated, and resilient investment portfolios consisting of genuinely diversified collections of fundamental return sources – portfolios that utilize risk more efficiently to generate returns and are better positioned to withstand unexpected macro shocks.

We dedicate a significant portion of this paper to explaining how we develop our long-term expected returns for the various asset classes. In fact, we encourage our readers to focus on the methodology, which – in our view – is more important than the return estimates themselves. Our methodology for constructing expected returns involves decomposing each asset class into fundamental risk factors and corresponding risk premia.

In addition, we believe that a well-designed asset allocation should not only aim to deliver high quality returns but also reflect a story about the specific investor: who they are, what they hope to achieve, and the corresponding plan to work towards that objective.

At face value, asset allocation refers to assigning different weights of investable capital to various asset classes with distinct risk and return characteristics. Fundamentally, such weightings should manifest our conscious construction of various risk premia that make up the expected returns from the corresponding asset classes. A truly efficient and thoughtful strategic asset allocation should reflect a well-diversified and appropriate combination of risk factors customized for the given investor.

Compared to the conventional asset-class-based framework, our risk premium approach allows us to craft a portfolio solution that is more intuitive from the perspective of the investor and can be calibrated to align more precisely with the investor's own interpretation of, and preferences for different risk types.

Ultimately, a strategic asset allocation is the anchor of a portfolio. It reinforces discipline during times of feast or famine and serves as a roadmap during times of uncertainty.

In order for a strategic asset allocation to accomplish what it has been designed for, we – as investors – must first believe in it. And in order to believe in a strategic asset allocation, we must first understand it: what risk exposures are we taking on and what corresponding returns should we reasonably expect?

The methodology discussed in this paper serves to translate a strategic asset allocation into an intuitive story that we hope to deliver to our clients – to ensure that it is understood, believed in, and ultimately succeeds.

TABLE OF CONTENT

I would like to thank Harry Singh, Jimmy Chang, and Dylan Bern for their insightful feedback and editing assistance.

RETURN ESTIMATES

Each year, we present our updated long-term return outlook for asset classes across public equities, traditional fixed income, commodities, select hedge fund strategies, and private investments (including equity, debt, and real estate). Our forecasts assume nominal returns denominated in US dollar. We also provide our prospective volatility assumptions by asset class.

While statistical estimates such as standard deviations and correlations are relatively easier to forecast given their persistence over time (in part due to the nature of underlying macroeconomic exposures), expected returns are notoriously difficult to estimate. Short-term (e.g., one-year) returns tend to be dominated by momentum and macro forces and are extremely difficult to forecast with any level of accuracy. Longer-term (i.e., multi-year) returns have stronger predictability yet still carry significant uncertainty.

In this paper, we provide two sets of long-term return forecasts.

i. The strategic forecasts represent our estimates of expected annualized returns over a ten-year horizon, with the starting point at the beginning of 2021.

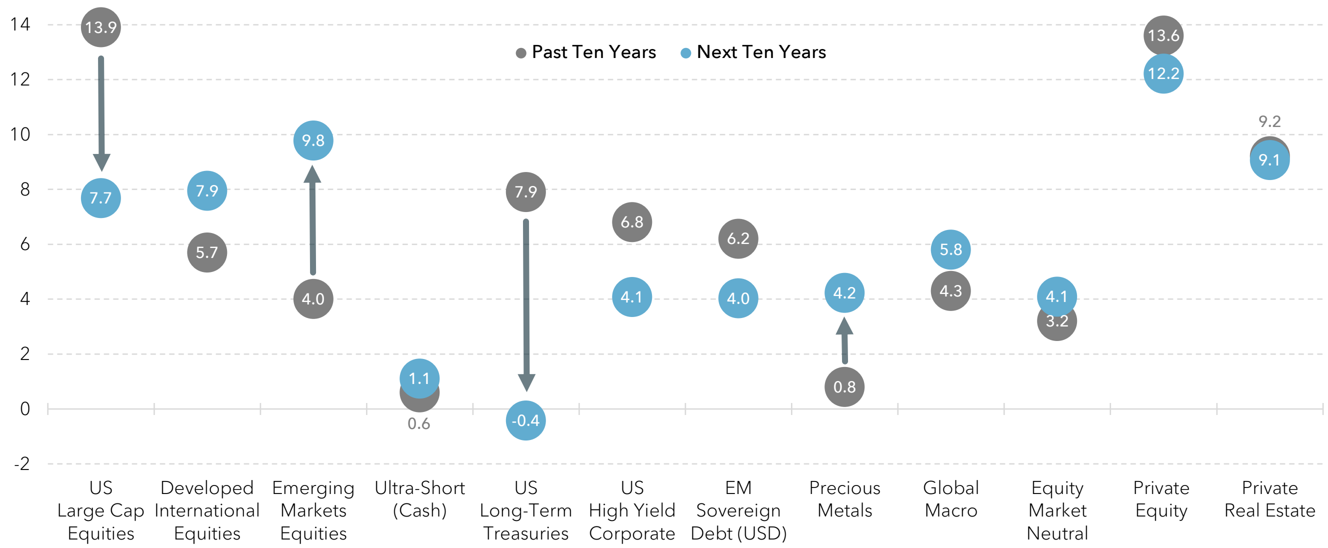
ii. The secular forecasts, on the other hand, extend decades beyond the next ten years. The multi-decade forecast horizon dilutes the impact of the starting point. The resulting minimal repricing effect on return estimates implies that asset valuations fluctuate around equilibrium levels, which in theory is how the market behaves over a sufficiently long time period. Thus, we also refer to the secular forecasts as "equilibrium returns."

Our process begins with constructing the secular forecasts, drawing from a combination of financial theories, historical long-term trends, as well as our macroeconomic outlook – on a probability weighted basis – of potential structural changes, such as shifts in policies, geopolitics, and demographics.

We then develop the strategic forecasts by building upon the secular returns and incorporating adjustments to asset class behavior (e.g., risk premium normalization) required to converge from the current macroeconomic environment towards the "equilibrium" state.

EXHIBIT 1

10-Year Annualized Nominal Returns for Select Asset Classes (%)



Potential Structural Shifts to Consider in the Next Decade and Beyond

We acknowledge that some left tail risks around the virus remain. Notably, potential significant delays in the vaccine rollout around the globe would provide a longer period for virus mutation, and consequently creating a greater probability – albeit still a small one – of a new strain that could derail the path to mass inoculation in 2021. Nonetheless, from a strategic point of view, it is fair to state that an end to the current pandemic, even accounting for the lingering tail risk, will be an eventual reality. Prior to 2020, we saw emerging signs with the potential of initiating changes that might be subtle at first but could eventually reshape the macroeconomic environment in the medium to long term. The pandemic has accelerated the progression of such developments. The following are what we consider the most important themes in the new investment landscape beyond the current crisis. Each theme has been selected based on our assessment of its likelihood as well as the magnitude of its potential strategic portfolio implications.

Theme 1

Higher Inflation and Higher Inflation Uncertainty

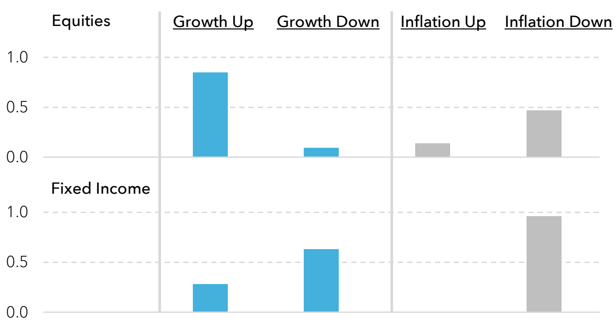
2020 was a year of extreme despair; it was also a year of resilience and hope. Record monetary easing and low interest rates played a key role in making the latter possible. Just two months after it was officially declared that the US had entered into a recession, the S&P 500 – after a record 34% decline over 22 trading days – had already swiftly recouped all of its losses and ushered in a new bull market.

Despite all the unprecedented events that occurred, 2020 was in some ways a continuation of the decade prior, in particular with regard to inflation (or the lack thereof). This is evidenced by the fact that US large cap stocks and long-term US Treasuries were the two best performing asset classes over the past ten years. While the two asset classes have opposing sensitivities to growth, both have historically favored disinflation.

EXHIBIT 2

Sharpe Ratios in Growth & Inflation Environments

1972 – 2020



Source: Bloomberg. S&P 500 Index, Barclays US Aggregate Index. Data from January 1972 to December 2020.

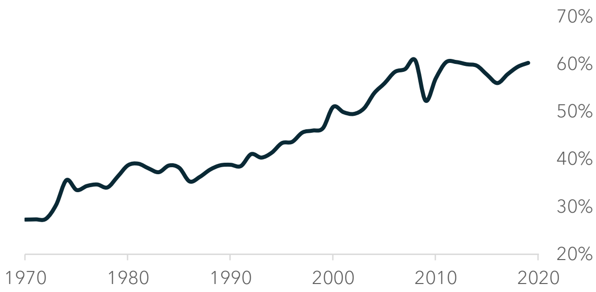
Looking ahead into the next decade, there is an argument to be made that we may be entering a new regime of higher inflation.

First, expansionary fiscal and monetary policies acting in coordination is clearly inflationary, especially over the medium term. One explanation for why years of interest rate cuts and quantitative easing have not led to higher inflation in the past decade is the continued decline in the velocity of money. The total amount of money supply becomes far less relevant if the liquidity transmission mechanism stalls. Direct government spending solves this issue by ensuring the flow of capital through the system into the hands of individuals and businesses, thus stimulating economic activity and ultimately lifting the overall prices of goods and services. Such expansionary government spending (albeit in various forms) is likely to continue well beyond the immediate pandemic crisis. The premature curbing of fiscal support after the global financial crisis is widely viewed to have contributed to the prolonged period of economic growth and employment weakness post-GFC. In addition, central banks – incentivized for a number of reasons – are likely to let inflation run sustainably above target by delaying the timeline for monetary tightening.

Another potential source of higher inflation arises if we enter an era of deglobalization. The hyper-globalization in the early 21st century unleashed substantial disinflationary forces by lowering costs of goods as well as reducing bargaining power of manufacturing workers in developed economies. Although global trade has slowed down in recent years amid escalating trade wars, supply chain issues highlighted during the pandemic, notably the lack of diversification and vulnerability to interruptions, have likely added momentum to the push for deglobalization.

EXHIBIT 3

Global Trade (% of GDP)



Source: The World Bank.

The third potential inflationary force is the redistribution of income from pro-capital to pro-labor. Wealth inequality in the US has been rising in the US since the early 1980s, which coincides with the beginning of a multi-decade decline in the US union membership. The income and wealth gap continued to widen in the first decades of the 21st century, driven in part by the rise of globalization and technological advances. The COVID-19 pandemic crisis has further exacerbated economic inequality to extreme levels not just in the US but in countries around the world. This has fueled widespread discontent and political turmoil, exerting pressure on governments to take actions to reduce inequality via policies such progressive taxation, higher minimum wages, and increased fiscal spending programs aimed at lower- and middle-income households.

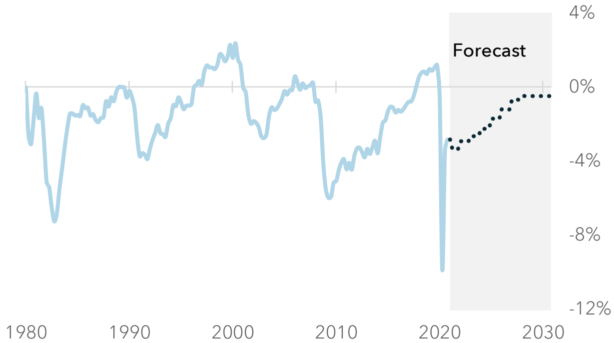
Based on the inflationary forces stated above, we could expect to see inflation in the medium term that is meaningfully higher than levels in the 2010s.

On the other hand, one counterargument for a rise in inflation is the continuing domination of technology. Along with the rise of globalization, tech contributed to the low inflation dynamics in the past decade via productivity increase and cost reduction across effectively all sectors within our economy. While globalization may be in retreat, we expect technological innovation will persist as a secular trend, thus exerting disinflationary influence in the coming decade and beyond.

Another counterargument to higher inflation in the medium term is the present negative output gap. Not surprisingly, the economy is producing a lot less at the moment than its potential, due to a combination of factors: parts of the economy remain shut down, consumer demand has collapsed, and most importantly, job losses stand at historic levels. A negative output gap, especially of this magnitude, is a transparent indication of substantial disinflationary pressure in the economy. The key questions are how much permanent economic destruction has occurred and how long it might take to close the output gap. After the global financial crisis, it took nine years for the output gap to turn positive. The CBO[i] is currently projecting that the output gap will still remain negative by 2030. Importantly, such an estimate is subject to significant variability. For example, demand-side fiscal actions such as infrastructure investments will translate directly into increased GDP and job creation.

EXHIBIT 4

US Output Gap



Source: Congressional Budget Office (CBO), Federal Reserve Economic Data. CBO projection is as of July 2020.

Our role as investment strategists is to form a logical understanding of the drivers behind the known conditions within the economy and financial markets and develop probabilistic estimates of what may come next. While we have higher confidence in the likelihood of these inflationary and deflationary forces individually, we are less certain of the net result of these forces combined. (With that said, we are quite confident in our outlook that runaway inflation remains unlikely. Following years of interest rate cuts and quantitative easing, central banks are well equipped to rein in inflation, should they choose to do so.)

We believe that the success of fiscal and monetary policy coordination, the political nature of which means it is inherently less certain, is one of the most critical determinants of the future fate of inflation. If we assume that the coordination is successful to some degree, this

[i] The Congressional Budget Office

together with the central banks' explicit pro-inflation bias (which raises the conditional expectations of future inflation on the upside) suggests that the realized average inflation rates over the next decade in developed economies will be modestly higher than the current market implied inflation expectations. We apply a greater upward adjustment to inflation rates in our model for the US than those in other developed countries, given the stronger fiscal impulse in the US, supported by a unified democratic government.

Relative to our inflation expectation estimates, we are more confident in our inflation volatility estimates. We believe that uncertainty around medium and long-term inflation expectations will continue to rise and remain somewhat elevated. This is partly a function of the additional macro variables introduced into the system, specifically the linkages across upside inflation surprises, economic growth, and long-term real yield – a dynamic feedback loop that investors had little need to examine in the past two decades, until perhaps now.

Theme 2

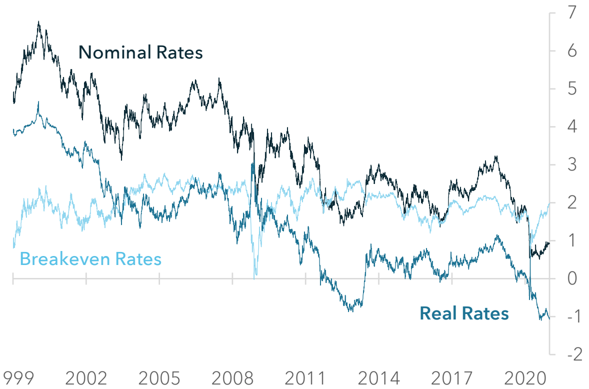
A Modest Rise in Real Rates

Rising inflation risk has several implications. Directly, higher inflation erodes asset prices and prospective investment returns in real terms, all else being equal. Perceived greater upside inflation risk in the coming years calls for strategic portfolio shifts to reduce overall vulnerability to rising inflation. (Importantly, actions intended to decrease portfolio sensitivities to inflation should be carefully calibrated so as not to result in unintended changes in sensitivities to other macro factors, such as growth.)

A potential new regime of higher inflation also introduces uncertainty around long-term real rates. Historically, inflation expectations and nominal rates tend to move in sync. In the US, the current divergence between 10-year breakeven rates and 10-year nominal Treasury yields is near the lowest levels over the past three decades.[i] This is in part due to the fixed income market's self-imposed yield curve control, influenced by the Federal Reserve's commitment to keep long-term nominal rates contained during the recovery phase. The intention behind this is to provide accommodative financial conditions to support the flow of credit to households and businesses while economic growth remains fragile. Ultimately, however, expectations of future economic growth are generally the most influential driver of the slope of the yield curve. Although monetary policies such as forward guidance and quantitative easing have significant effects, maintaining (not to mention widening) the current degree of divergence may become increasingly more difficult to justify as the economy continues to recover and growth eventually normalizes.

EXHIBIT 5

US 10-Year Breakeven Rates, Nominal, and Real Rates (%)



Source: Bloomberg. Data from January 1999 to December 2020.

Our estimates of future real rates are important inputs in our strategic return forecasts. The financial market, in large part, is a discounting mechanism. The multi-decade decline in long-term real rates – in particular, the rapid descent in 2020 – has significantly lifted valuation levels for asset classes across the board. A potential reversal of this trend and the corresponding asset repricing pose a key risk to prospective investment returns in the coming years.

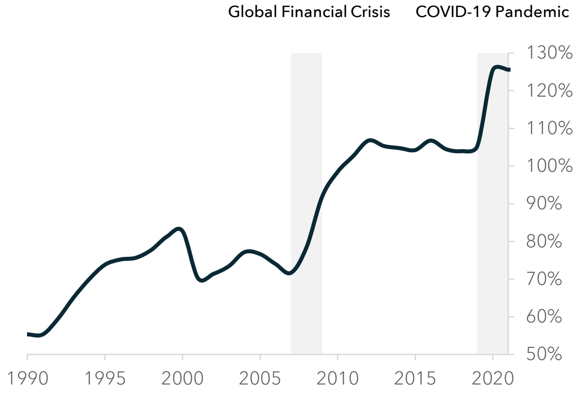
Our base case outlook is that real rates will rise modestly in the coming decade but will likely remain in negative territory for a substantial period of time.

The COVID-19 crisis has led to a surge in debt levels across governments, businesses, and households. In particular, dramatic increases in fiscal spending to combat economic destruction by the pandemic have caused national debt to rise to unprecedented levels. According to projection by the IMF, the debt-to-GDP ratio of developed economies in 2021 will reach a record high of 125%.

[i] The US 10-year TIPS breakeven rates are available beginning September 1988.

EXHIBIT 6

Debt-to-GDP ratio of Developed Economies



Source: International Monetary Fund.

With the ongoing pressure for continued expansionary fiscal actions and the sustainability of national debt levels in question, we believe that central banks are strongly incentivized to keep nominal rates low while encouraging higher inflation, with the goal of monetizing national debt over time by maintaining negative real interest rates. This approach is a much less painful solution to managing fiscal deficits relative to the traditional alternative approach of fiscal austerity measures. As policymakers in developed countries increasingly embrace the notion of debt monetization, this may exert a powerful force that will likely confine the degree of rise in real rates in the medium term.

As debt monetization is inherently inflationary – the greater opportunity cost of holding cash stimulates spending and economic activity – we may experience a scenario in which long-term nominal rates rise significantly faster than expected, driven by bond holders demanding greater term premium. Term premium is the additional compensation that investors demand for bearing the uncertainty in future inflation (versus deflation).

It is important to point out that, while higher long-term real rates weigh on valuation, a rising real rate environment does not necessarily imply poor investment returns for asset classes across the board.

This is because higher long-term real rates are most likely to occur when the economy is performing well, especially as interest rates need to "fight" against central banks' desire to keep them contained. Asset classes that are sensitive to growth expectations such as stocks (generally speaking) actually tend to fare better in an environment of improving inflation expectations and rising real rates. Said differently, the positive effect of improving earnings (growth) is expected to largely offset the negative effect of lower price multiples (valuation).

Theme 3

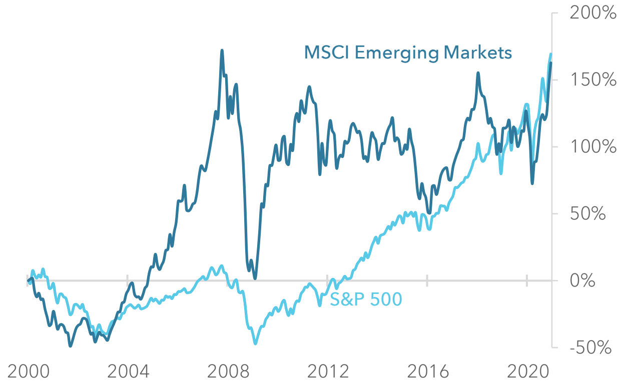
Divergence in Long-Term Growth Trends

We expect that the pandemic may be a secular turning point in long-term growth trends for developed versus emerging economies.

The first decade of the 21st century was filled with optimism for emerging markets, supported by the rapid rise of globalization. The optimism, however, did not last long. In the aftermath of the global financial crisis, most commodity-sensitive emerging countries lost momentum and suffered more than a decade long period of economic stagnation. South Korea, Taiwan, and China – countries whose market capitalizations currently dominate the MSCI Emerging Markets index – are not the norm but rather the few exceptions among emerging countries that were able to continue their advancements by leveraging manufacturing and export advantages.

EXHIBIT 7

Cumulative Price Returns in the Past Two Decades (%)



Source: Bloomberg. S&P 500 Index, MSCI Emerging Markets Index (USD). Data from January 2000 to December 2020.

The COVID-19 crisis has accelerated structural shifts in social, economic, and technological conditions. Notably, the crisis has led to a mass adoption of digital technology. This, we believe, has the potential of disproportionally benefiting the domestic economies of the less-advanced countries within emerging markets. Such countries do not have the legacy infrastructure burden. The embrace of the digital revolution catalyzed by the pandemic, as a result, could unleash a rapid boost in productivity. Simultaneously, an improvement in the breadth of economic growth within emerging markets has the potential of creating a multiplier effect by energizing and transforming regions, beyond individual countries.

The pandemic, on the other hand, has likely created more secular headwinds rather than tailwinds for economic growth within developed countries. Although the crisis has exacerbated income and wealth inequality and created widespread discontent with governments across countries in both developed and emerging markets, the policy responses are starkly different. Many emerging countries, without the fiscal means to increase direct social spending, are pushing economic reforms in an effort to ease financial pains. Although such actions need time to take effect, they have positive economic implications in the long term.

Policymakers in developed countries are more inclined to address the issue of growing economic inequality via policy actions such as progressive taxation and higher minimum wages. The pandemic crisis has also led to a greater push by developed countries for deglobalization and self-reliance. Such policy changes are likely to result in higher production costs and lower profit margins. In addition, developed countries have resorted to more aggressive deficit-financed fiscal spending. National debt issuance in developed markets has increased by twice the amount compared to emerging markets (20% of GDP vs. 10% of GDP, according to the IMF's latest estimate). Of course, this is partly a reflection of developed countries' stronger credit fundamentals and ability to raise more debt. In the longer term, however, higher debt levels and greater interest expense burden, despite the central banks' efforts to keep nominal rates low, will likely weigh on GDP growth in developed economies more so than in emerging economies. Although the economic effects in the near term of such deficit-financed fiscal spending are likely positive due to anchored nominal rates, historically high levels of national debt inherently increase the vulnerability of developed economies during future economic downturns and ultimately pose a risk to long-term growth potential.

PUBLIC EQUITIES

Our 10-year strategic outlook for equities is comprised of four components: *carry, inflation, growth, valuation*. The differences between our strategic and secular forecasts are primarily driven by cyclical adjustments to real earnings growth relative to long-term trends, as well as repricing effects (i.e., expected changes in valuations). With global equities in the early stage of a market cycle, our overall strategic forecasts reflect an acceleration in earnings growth offset by some degree of price multiple normalization. Although our strategic forecasts reflect annualized returns over the next decade, we expect the tug-of-war dynamics between growth vs. valuation to take place in the early part of the 10-year period.

2021 Expected Long-Term Nominal Returns for Public Equities[i] (%)

TABLE 1

	Strategic	*Secular*		*Historical*[ii]	
	(10-Year)	*(Equilibrium)*	Past 20 Years	Past 15 Years	Past 10 Years
US Equities					
US Equities All Cap	7.9	7.5	7.8	10.0	13.8
US Equities Large Cap	7.7	7.5	7.5	9.9	13.9
US Equities Mid Cap	9.0	8.1	9.3	9.6	11.5
US Equities Small Cap	9.8	8.2	8.7	8.9	11.2
Developed International Equities					
Developed Int'l Large & Mid Cap	7.9	5.9	5.1	5.0	5.7
Europe ex-UK	*8.1*	*6.3*	*5.5*	*5.9*	*7.0*
UK	*7.4*	*5.5*	*3.2*	*2.9*	*3.1*
Japan	*7.3*	*4.7*	*3.9*	*3.7*	*6.8*
Pacific ex-Japan	*8.8*	*6.8*	*8.8*	*7.3*	*5.0*
Canada	*8.8*	*7.1*	*6.1*	*4.5*	*2.2*
Developed Int'l Small Cap	8.9	7.4	8.9	6.3	7.4
Emerging Markets Equities					
Emerging Markets Large & Mid Cap	9.8	8.4	9.9	7.0	4.0
EM Asia	*10.0*	*9.2*	*11.0*	*9.0*	*6.9*
EM Europe, Middle East & Africa	*8.4*	*4.0*	*6.4*	*1.8*	*-1.2*
EM Latin America	*8.2*	*2.1*	*8.4*	*4.0*	*-3.2*
Emerging Markets Equities Small Cap	10.8	9.9	10.4	7.1	2.6
Global Equities					
Global Equities Large & Mid Cap	8.1	7.2	6.7	7.8	9.7
Global Equities Small Cap	9.7	8.2	9.6	8.6	9.3
Yield Enhancement					
REITs	7.3	6.3	8.1	5.2	6.3
MLPs	6.6	5.3	7.5	3.6	-2.3

[i] Annualized returns (geometric averages).
[ii] Index total returns gross of dividend withholding taxes.

Methodology

Numerous scholars and practitioners alike have directed their efforts toward forecasting long-term expected equity returns. Various academic publications have discussed and compared the efficacy of popular frameworks such as backward-looking measures of excess returns of stocks over bonds as well as forward-looking supply-driven frameworks such as the dividend discount model (DDM) by Myron Gordon (1962)[2]. In this paper, we draw upon the building-block approach by Roger Ibbotson and Chen Peng (2003)[3], and decompose 10-year expected equity returns into four components: (1) carry, (2) inflation, (3) growth, and (4) valuation.

Carry represents expected income return or cash paid out to investors.

Inflation represents expected inflation rate over the long term.

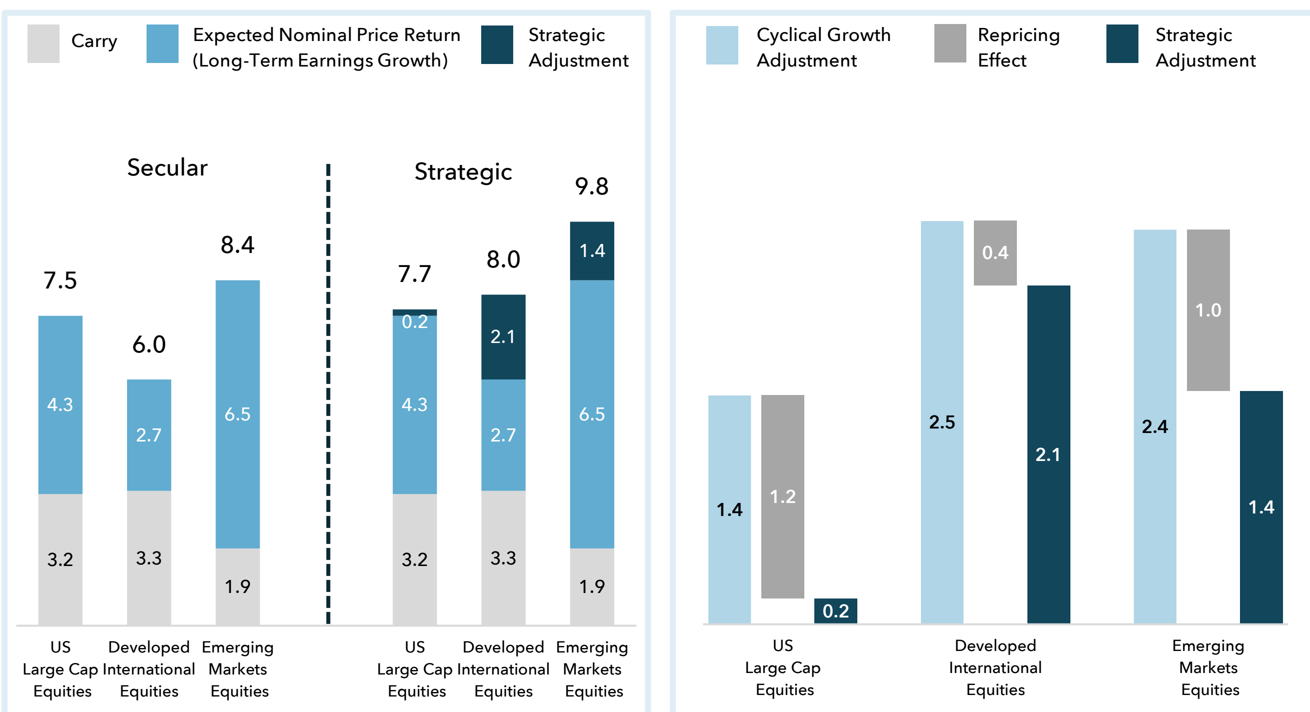
Growth represents expected real growth rate of earnings per share. *(Inflation and Growth combined represent expected nominal growth rate of earnings per share.)*

Valuation refers to repricing effect due to expected changes in price multiples.

Expected Nominal Return = Carry + Inflation + Growth + Valuation[i]

EXHIBIT 8

Summary of Public Equities Long-Term Nominal Return Forecasts (%)



[i] The exact equation is Expected Return = Carry + [(1 + Inflation) * (1 + Growth) - 1] + Valuation. The equation displayed above is a close approximation when inputs are small percentages, as the compounding effect associated with multiplication is expected to be minimal.

Carry

Carry Yield = Dividends + Buybacks – New Issuance

Dividend Yields

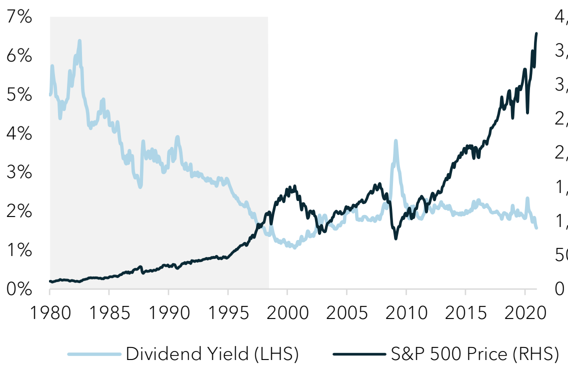
Carry, in the context of equity investing, represents the amount of cash income paid out to investors.

Historically, the narrow definition of equity carry was limited to dividend yields. More recently, the measure of carry has expanded to include yields from share buybacks (positive yields) and new issuance (negative yields).

In the early 1980s, dividend yields on S&P 500 stocks fluctuated between 4% and 7%. Since the 1982 change in SEC rules (10b-18), providing companies with safe harbor from price manipulation charges for conducting share buybacks, it has become increasingly prevalent among US companies to return excess cash to investors via share buybacks (which are viewed as more flexible and more tax-efficient) instead of increasing dividends. Over the subsequent two decades, S&P 500 dividend yields trended downwards and ultimately settled at around 2% throughout the 2000s.

EXHIBIT 9

S&P 500 Dividend Yields vs. Price Returns

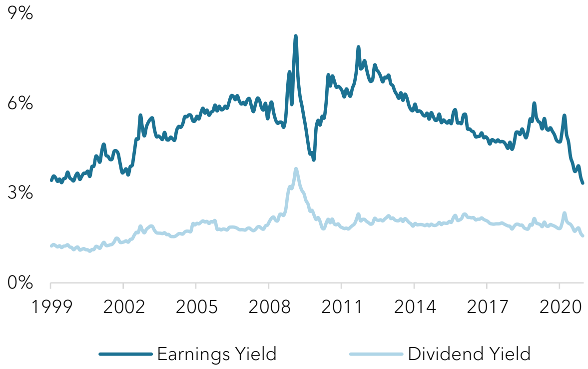


Source: Bloomberg. S&P 500 Index. Data from January 1980 to December 2020.

Company managements' preference for share buybacks over dividends is partly due the fact that dividends are viewed as sticky. It is less frowned upon for management to reduce share buybacks during economic downturns than for them to cut or eliminate dividends. Throughout the market cycles since 1999, S&P 500 dividend yields displayed substantially lower volatility than earnings yields, which showed greater cyclical variation.

EXHIBIT 10

S&P 500 Earnings Yields vs. Dividend Yields



Source: Bloomberg. S&P 500 Index. Data from January 1999 to December 2020.

Although dividend yields in the US have been fairly steady in the 21st century, there has been overall an increase in dividend yields on non-US stocks across all regions around the globe, with a noticeable stabilization in recent years. The rise in dividend yields corresponds with a similar upward trend in payout ratios. In our view, this is in part driven by the increasing focus on strengthening corporate governance and improving shareholder returns, as stock markets continue to mature in many countries.

Given the structural nature of such developments, we use the five-year trailing average as our forecast. Taking a longer-term historical average would likely result in an underestimation of future dividend yields, especially for non-US equity indices.

Net Buybacks = Gross Buybacks – Gross Issuance

To capture the total cash yields paid to investors, we expand upon dividend yields by also including the effect of share buybacks.

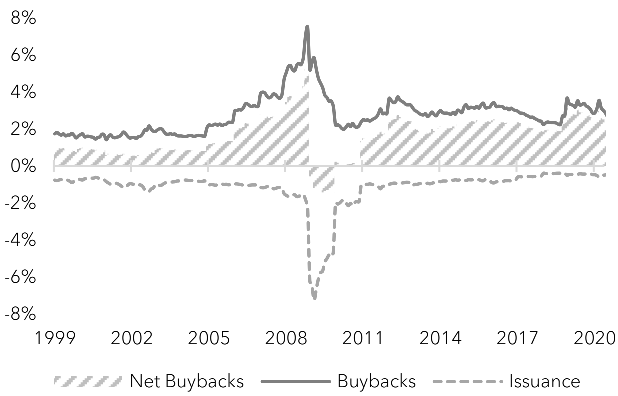
Gross share buybacks overstate the effective yields. While companies may distribute cash to investors through dividends and stock buybacks, companies may also reverse the capital flow by issuing seasoned equity to raise additional cash from investors.

We define "effective equity carry" as the sum of dividend yields and net buyback yields, with net buybacks being the difference between gross share buybacks and gross new issuance.

EXHIBIT 11

S&P 500 Net Buyback Yields

Net Buybacks = Gross Buybacks – Gross Issuance



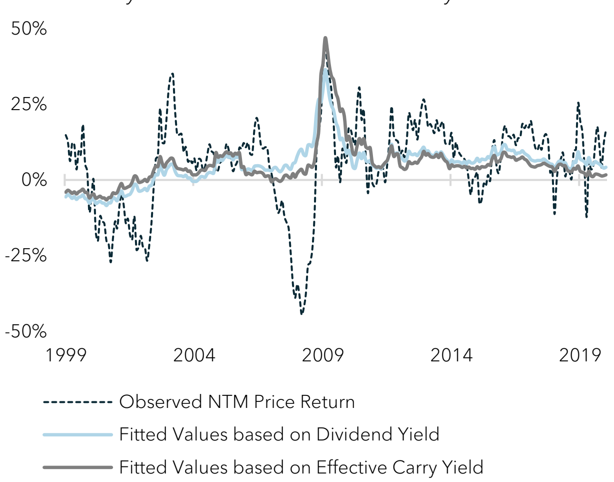
Source: Bloomberg. S&P 500 Index. Data from January 1999 to December 2020.

Compared to dividend yield alone, effective equity carry yield is a stronger predictor of next 12-month price returns, as illustrated below.

EXHIBIT 12

Next-12-Month S&P Price Returns Predicted by Yields

Effective Carry Yield = Dividend Yield + Net Buyback Yield

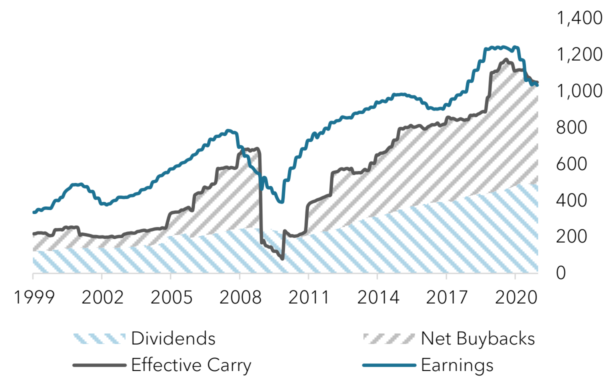


Source: Bloomberg. S&P 500 Index. Data from January 1999 to December 2020.

Between 1999 and 2020, the annualized volatility of net buyback yields (adjusted for inflation) on the S&P 500 is roughly twice the volatility of dividend yields. The greater fluctuations of net buyback yields are due to the flexible nature of buybacks and issuance. As corporate earnings improve and cash balances build up, buybacks and new issuance tend to rise and fall, respectively. Generally, buybacks increase in the later stages of a market cycle when organic growth becomes scarcer, whereas new issuance tends to increase in the earlier stages of a market cycle.

EXHIBIT 13

S&P 500 Total Cash Paid Out to Investors ($Billion)



Source: Bloomberg. S&P 500 Index. Data from January 1999 to December 2020.

Such cyclicality is even more pronounced for non-US stocks, where idiosyncratic, country-specific events dominate market behaviors. For example, net buyback yields fell substantially for MSCI Spain and Italy indices during the European Sovereign Debt crisis. Over the same period, however, net back yields actually increased for MSCI France and Germany indices.

To dilute the impact of such idiosyncratic one-time events, we take the average of 12-month trailing net buyback amounts (adjusted for inflation) over a long period (specifically, going back to January 1999) and divide it by the current equity market capitalization to reach an estimate of future country-specific equity yields from buybacks and net issuance.

Note that we use shorter historical average periods for stock markets in the US and Japan, where there have been noticeable structural shifts in the proliferation of share buybacks in more recent years. Specifically, we apply a 15-year average for the S&P 500 and a five-year average for the MSCI Japan index.

Expected Carry Yields by Region

United States

Exhibit 14

Expected Carry Yields by Market Cap (%)

	Dividend Yield	Net Buyback	Carry Yield
US All Cap	1.9	1.0	2.9
Large Cap	2.0	1.2	3.2
Mid Cap	1.7	0.5	2.2
Small Cap	1.5	-1.4	0.1

Source: Bloomberg. S&P 500 Index, S&P Midcap 400 Index, and Russell 2000 Index. Data from January 1999 to December 2020.

The proliferation in share buybacks in the US in the past two decades has concentrated mainly within large cap and mid cap stocks. This has substantially lifted carry yields relative to dividend yields. On the other hand, the amounts of cash that small-cap companies have raised from investors through new issuance and the amounts of cash that such companies have paid out to shareholders through dividends and buybacks on average roughly offset each other, resulting in minimal carry yields on US small cap stocks.

Developed International

Exhibit 15

Expected Carry Yields by Region (%)

	Dividend Yield	Net Buyback	Carry Yield
Developed International	3.2	0.1	3.3
Europe ex-UK	3.2	0.0	3.2
UK	4.5	0.2	4.7
Japan	2.2	0.4	2.7
Pacific ex-Japan	4.1	-0.6	3.4
Canada	3.0	-0.2	2.8

Source: Bloomberg. MSCI Indices (World ex-US, France, Germany, Switzerland, Netherlands, Sweden, Spain, Italy, UK, Japan, Australia, Hong Kong, Singapore, Canada). Returns in USD. Data from January 1999 to December 2020.

While cash paid out to investors by US companies has been substantially boosted by share buybacks, yields on stocks in developed ex-US countries have been predominantly in the form of dividends. Net buyback yields are minimal across Europe and the UK, slightly positive in Japan, and negative in Pacific ex-Japan and Canada, where new issuance has on average exceeded gross buybacks.

Emerging Markets

Exhibit 16

Expected Carry Yields by Region (%)

	Dividend Yield	Net Buyback	Carry Yield
Emerging Markets	2.5	-0.6	1.9
South Korea	2.0	-0.1	1.9
Taiwan	3.9	-0.3	3.6
China	2.2	-0.7	1.5
India	1.4	-0.9	0.5
Brazil	3.1	-1.6	1.5
South Africa	3.0	-1.1	1.8
Russia	5.7	-0.6	5.1

Source: Bloomberg. MSCI Indices (Emerging Markets, South Korea, Taiwan, China, India, Brazil, South Africa, and Russia), Returns in USD. Data from January 1999 to December 2020.

Although emerging markets equities overall offer decent dividend yields (five-year average trailing 12-month dividend yield at 2.5%), net effective carry yields are weighed down by share issuance, which dilutes the amount of earnings per share paid out to investors. New issuance tends to be more active in emerging markets and has been a driver of market capitalization expansion in countries such as China, India, and Brazil.

Inflation

In our prior years' capital market assumptions, we estimated future long-term inflation rates for individual countries using the latest 10-year breakeven rates (when available). In general, breakeven rates are strongly associated with market-implied inflation expectations, as breakeven rates equal the differences between real yields on inflation-protected sovereign debt and nominal yields on fixed-rate sovereign debt of the same maturity.

This year, we revise our approach to inflation forecasts by considering not only breakeven rates, but also survey-based inflation estimates as well as historical averages of realized inflation measures.

This change in our approach is mainly driven by our belief that current breakeven rates may be disproportionally skewed by near-term investor sentiment. Breakeven rates exhibited significant volatility in 2020, likely driven by large fluctuations in inflation risk premium. Specifically, inflation risk premium tends to fall during periods of deflation scare. This was particularly evident during March 2020, when the collapse in 10-year breakeven rates was so dramatic that it could not be reasonably justified by potential changes in inflation expectations over the next decade, even accounting for the estimated GDP destruction due to the pandemic. In theory, one could solve for market-implied "true inflation expectations" by subtracting inflation risk premium from observed breakeven rates. Inflation risk premium, however, is not directly observable.

Overall, our long-term inflation estimates for developed countries are slightly above 10-year historical medians. This is consistent with our theme of a higher inflation regime, as discussed at the beginning of this paper.

Our long-term inflation estimate for the US is 2.25%. This is based on our assumption that core PCE, the Federal Reserve's preferred inflation measure, reaches an average of 2% over the medium to long term. The additional 25bps reflects the historical 10-year average gap between core PCE and core CPI, due to differences in component weightings within the two indices.

EXHIBIT 17

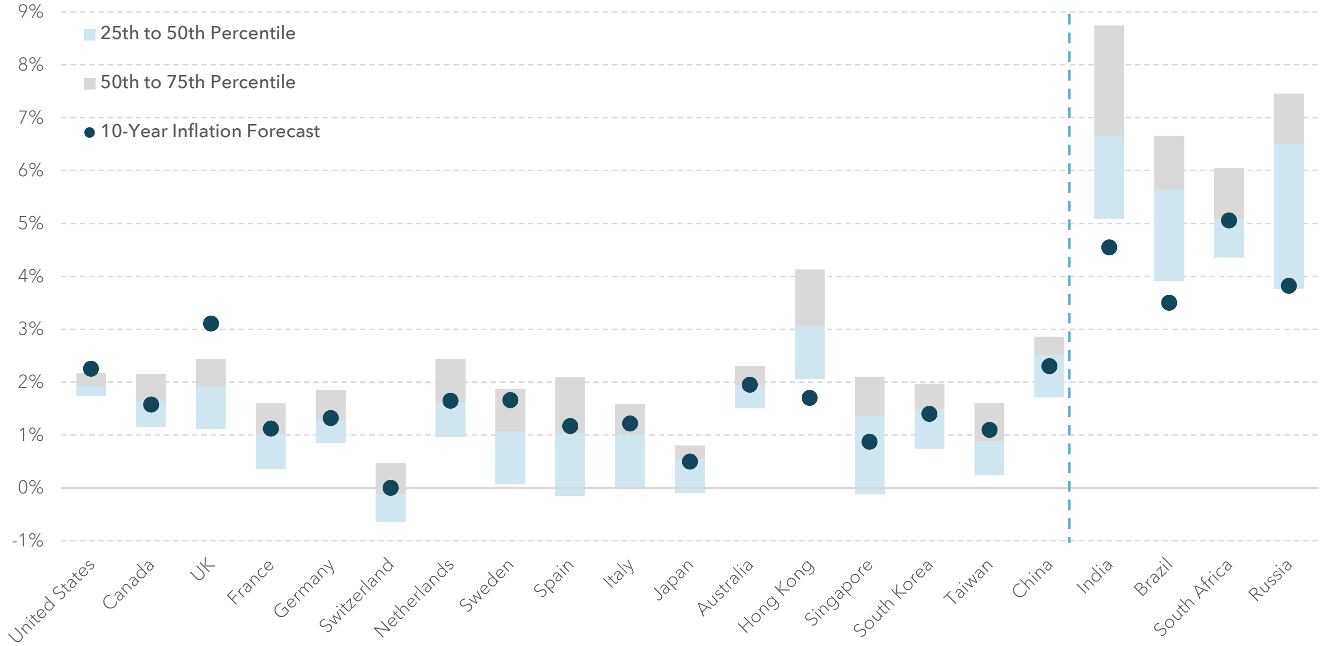
Long-Term Inflation Forecasts by Country (%)

Country	Long-Term Inflation Forecasts	Historical Percentile
United States	2.3	87
Canada	1.6	53
UK	3.1	89
France	1.1	58
Germany	1.3	43
Switzerland	0.0	56
Netherlands	1.7	52
Sweden	1.7	64
Spain	1.2	54
Italy	1.2	67
Japan	0.5	61
Australia	2.0	58
Hong Kong	1.7	16
Singapore	0.9	62
South Korea	1.4	55
Taiwan	1.1	57
China	2.3	55
India	4.6	21
Brazil	3.5	21
South Africa	5.1	49
Russia	3.8	26

Source: Bloomberg. Data as of December 2020. Percentiles ranked based on 20-year historical inflation measures.

EXHIBIT 18

Long-Term Inflation Forecasts versus Historical Inflation Rates (CPI) by Country



Source: Bloomberg. Data from January 2000 to December 2020.

Growth

Real Earnings Growth = Long-Term Trend Growth + Reversion to Trend (Cyclical Adjustment)

Consensus Forecasts vs. Empirical Trends

Forecasting long-term expected equity returns is somewhat synonymous with estimating ex ante "equity risk premium" – the excess returns that equities are expected to deliver over some fixed-income alternatives (e.g., 10-year US Treasuries) – as long-term returns of high-quality bonds tend to be fairly transparent[i].

Research by Antti Ilmanen (2011)[4] argues that the relevance of equity risk premium stems from the notion that bonds are the main asset class competing with stocks for investor capital. The attractiveness of equity risk premium exerts a potential influence on asset allocation decisions.

Growth is closely tied to the justification for equity risk premium. Equity investors are willing to take on the additional risk associated with being the residual claimants for company assets – versus holding comparable bonds with more senior claims – because stocks are the main investments providing exposure to long-term economic growth. Stock prices today represent current and expected future cash flows generated from corporate profits. Given stable payout ratios and valuation multiples, the growth rate of earnings per share has a direct effect on stock prices.

We consider two common approaches to estimating future earnings growth: (1) a top-down, forward-looking approach that relates corporate earnings growth to consensus forecasts of country-specific GDP growth, and (2) a bottom-up, empirically based approach that estimates future earnings growth based on past trends.

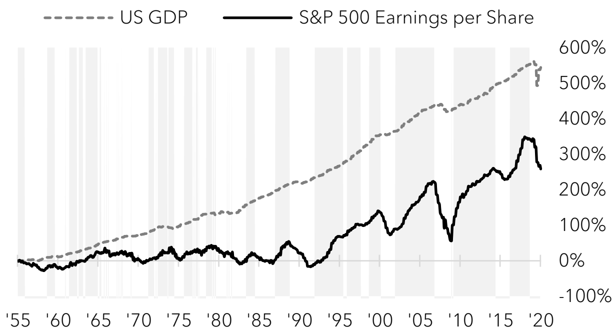
Economists' consensus forecasts of long-term GDP growth rates are typically fairly stable. The advantage of using survey measures is that professional estimates generally take into account structural changes that do not mean-revert, which statistical analyses of series in historical time often fail to identify and handle properly.

The weakness of the top-down approach using consensus GDP forecasts, however, is the frail relationship between historical corporate earnings growth rates and the GDP growth rates of the issuer countries.

Between 1955 and 1995, the real growth rate of S&P 500 reported earnings per share (EPS) lagged that of US GDP. This pattern was reversed during the subsequent decades. Between 1995 and 2015, S&P 500 earnings per share grew at a substantially higher real rate than the US economy.

Exhibit 19

Cumulative Real Growth: US GDP vs. S&P 500 EPS



	Annualized Real Growth Rate	
Period	*US GDP*	*S&P 500 EPS*
1955 - 1975	3.5%	0.2%
1975 – 1995	3.2%	2.4%
1995 – 2005	3.4%	5.2%
2005 - 2015	1.5%	2.1%
2015 - 2020	1.4%	0.8%
1955 - 2020	**2.9%**	**2.0%**

Source: Bloomberg, IMF, Bureau of Economic Analysis. S&P 500 Index Trailing 12-month Reported Earnings. Data from December 1955 to December 2020.

It is intuitive to assume that GDP growth rates and corporate-earnings growth rates should converge over a long horizon. Otherwise, public companies' market capitalization as a percentage of the corresponding country's aggregate wealth could ultimately either approach zero if long-term earnings growth remains

[i] The predictability by initial nominal yields of medium to long term returns for high quality bonds is discussed in a later section under "Fixed Income – Current Nominal Yield."

below GDP growth, or one hundred percent if long-term earnings growth remains above GDP growth. As illustrated in our analysis, however, the stationary relationship between GDP growth rates and EPS (earnings per share) growth rates appears rather weak. The mean reversion process between the two, which began in 1955, has still not yet fully completed.

One explanation for this is the declining number of public companies. Research by Goldstein, Zhao and Yu (2018)[5] finds that there are fewer public companies today than at any time in the last 40 years. A growing percentage of corporate earnings are now captured by a concentrated pool of entrepreneurs and private equity investors and are thus absent from EPS growth of public equity indices.

Another explanation is the effect of share dilution. This is particularly apparent for emerging market equities. Between 1996 and 2020, China's reported real GDP grew on average nearly 9% per year (inflation-adjusted). The country's ratio of market capitalization to reported GDP increased roughly six-fold (Federal Reserve Bank of St. Louis)[6]. Over the same period, however, the annualized total return earned by shareholders was only 3.3% on an inflation-adjusted basis[i].

EXHIBIT 20

China: Reported GDP Growth vs. Stock Total Return

Hypothetical $1 compounded from 1996 to 2020.

Source: Bloomberg, IMF, Bureau of Economic Analysis. MSCI China Total Return. Data from January 1996 to December 2020.

Share issuance can be detrimental to equity investors' participation in corporate earnings growth due to ownership dilution. In emerging market countries where market capitalization expansion is heavily driven by issuance, we expect GDP growth forecasts to have particularly weak predictive power of future EPS growth.

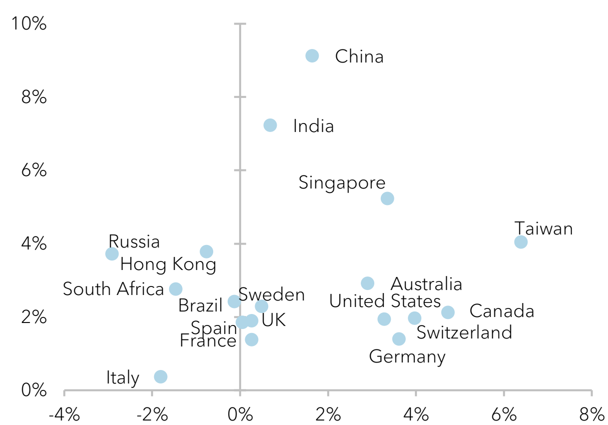
In addition, with increasing globalization, particularly over the last two decades, we expect continuous weakening of the relationship between corporate earnings growth and the GDP growth of issuer countries, as multinational companies outsource production to lower-cost developing markets and tactically adjust international strategies by rotating towards emerging consumer markets to uncover revenue potential. As of December 2020, 40% of the revenue of companies included in the S&P 500 index is generated from outside the US. On a sector level, this percentage increases to 57%, 55%, and 42% for Information Technology, Materials, and Consumer Staples, respectively (Factset 2020)[7].

Another critical explanation for the weak linkage between country GDP growth and EPS growth is the composition of country-specific equity indices (e.g., MSCI indices). For example, the largest company within the MSCI South Korea index represents roughly one quarter of the index market cap. The MSCI Netherlands index is even more extreme, as its top holding has weighting of around 30%. In short, index composition matters. In many cases, the characteristics of a country-specific index are poor representations of the economic profile of the country.

EXHIBIT 21

Weak Linkage between GDP Growth & EPS Growth

Annualized Average Growth from 2000 to 2020
Horizontal Axis: Real Earnings per Share Growth Rate
Vertical Axis: Real GDP Growth Rate



Source: Bloomberg, IMF, Bureau of Economic Analysis. S&P 500 Index, MSCI Country Indices. Data from 2000 to 2020.

[i] MSCI China Index.

Real EPS Growth Forecast Methodology

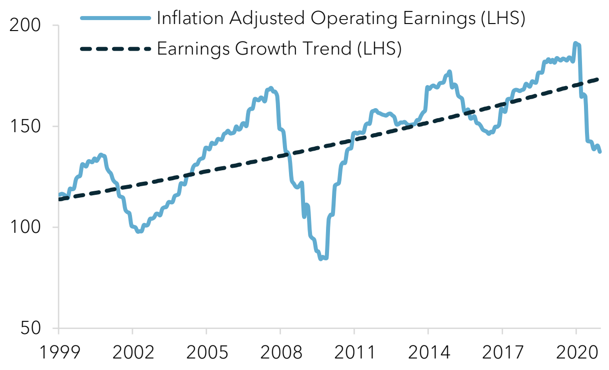
To avoid mechanically equating earnings growth forecasts to GDP growth forecasts, we consider the alternative bottom-up, empirical-based approach. We draw upon the framework espoused by Andrew Sheets and his co-authors in 2017[8], decomposing expected real earnings growth into two components: (1) long-term trend growth and (2) reversion to the trend (cyclical adjustment).

Long-Term Trend Growth

We consider real earnings per share to follow a lognormal distribution. In keeping with exponential regression, we can estimate the annualized growth rate given a historical time series of trailing 12-month earnings per share. We consider this a superior approach versus simply taking the geometric average across historical EPS, as the latter is highly sensitive to one's choice of the starting and ending points of a time series.

EXHIBIT 22

S&P 500 LTM Operating Earnings per Share



Source: Bloomberg. S&P 500 Index. Data from January 1999 to December 2020.

We choose a historical time period from 1999 to present for establishing an "equilibrium" growth trend. In theory, a longer historical window reduces noise from sample selection bias. However, given the recent substantial structural changes in the financial markets, we believe that distant historical data may have become less relevant, compelling us to focus on the most recent two decades.

We construct the historical time series of EPS using operating earnings as opposed to reported earnings. This choice is partially a result of some negative historical 12-month trailing reported earnings observed in countries such as Japan and South Korea (due to lingering impact from the Asian financial crisis), which pose a challenge to the applicability of exponential regression.

US equities, in particular the S&P 500, experienced a period of significant profit margin expansion in the second half of the 2010s, in part driven by tax cuts and share buybacks. We feel that operating earnings are more appropriate than reported earnings for estimating the future earnings growth trend. Operating earnings capture the key components that impact a company's long-term profitability while excluding one-time or cyclical effects due to changes in capital structure, interest rates, and tax rates, all of which have generated substantial tailwinds for corporate earnings over the recent years.

For certain countries, particularly in developed markets, we have applied modest downward adjustments to long-term trends to account for the potential structural headwinds to economic growth in the medium to long term, e.g., significant national debt levels, a potential reversal in wealth and income distribution from pro-capital to pro-labor, increasing regulation risk, etc. This is discussed in greater details at the beginning of this paper.

Reversion to the Trend (Cyclical Adjustment)

Once we establish a long-term trend that forms the baseline estimate for expected future earnings growth, we apply a moderate adjustment to account for any mean-reverting cyclical effects.

There are two reasons why observed operating earnings per share would fall above or below the long-term trend.

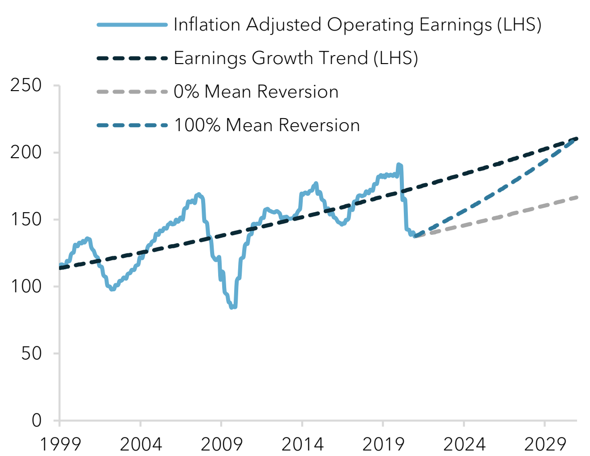
The first reason is a combination of structural shifts (e.g., degree of globalization and composition of employment) and secular trends (e.g., aging populations and fiscal reforms), which are deep-rooted and unlikely to dissipate over the next decade. In this case, we apply no reversion adjustments and assume that the observed trend rate is a reasonable estimate of long-term terminal growth rate.

The other reason is cyclical swings (e.g., short-term interest rates, currency movements, and commodity prices), which have the tendency to mean-revert. In this case, we would assume a correspondingly weaker/stronger expected growth rate such that earnings growth would converge to the implied long-term trend over the next decade.

We acknowledge that the distinction among "structural," "secular," and "cyclical" elements is not definitive. Structural shifts can emerge from secular trends, and secular trends can develop from sustained cyclical effects.

Exhibit 23

S&P 500 LTM Operating Earnings per Share



Source: Bloomberg. S&P 500 Index. Data from January 1999 to December 2020.

When the deviation of earnings from long-term trend is primarily driven by what we consider cyclical swings, it may be tempting to incorporate a cyclical adjustment to earnings growth by assuming a simple full mean reversion towards long-term trend growth, especially if the historical earnings of the equity index being considered exhibit a strong track record of reversion to the mean. Nonetheless, a key factor to consider is how much the potential cyclical earnings revision has already been priced in. Often, when sell-side analysts revise their earnings estimates, especially when the revisions are somewhat related to macro developments, it is quite likely that the market has already anticipated such earnings revisions and reflected the potential effects on asset valuation in equity prices – sometimes even before sell-side equity analysts have begun to contemplate potential revisions. This is particularly relevant in the early and late stages of a market cycle when the rates of change in earnings are often frequent and significant. Correspondingly, we need to solve for how much of our expected changes in future earnings have already been reflected in equity prices, so as to avoid double counting.

Expected Growth Rates by Region

United States

Exhibit 24

Expected Real Growth Rates by Market Cap (%)

	Trend Growth	Reversion to Trend	10-Year Growth
US All Cap	2.4	1.5	3.9
Large Cap	2.1	1.4	3.5
Mid Cap	3.6	1.3	4.9
Small Cap	4.7	2.5	7.2

Source: Bloomberg. S&P 500 Index, S&P Midcap 400 Index, Russell 2000 Index. Data from January 1999 to December 2020.

Within the US, cyclical adjustment to earnings growth is the smallest for large cap. The S&P 500 is more defensive and less volatile due to its sector composition. On the other hand, small cap stocks are overall more cyclically sensitive, with higher beta of earnings to GDP. Naturally, a reversion to long-term trend translates into more substantial earnings growth acceleration for small cap. Note that the rate of change in earnings growth can be especially pronounced for small cap during the early recovery stage of a cycle. In the second half of 2020, the magnitude of upward revisions to 2021 EPS consensus estimates for US small cap tripled that of US large cap.

Developed International

Exhibit 25

Expected Real Growth Rates by Region (%)

	Trend Growth	Reversion to Trend	10-Year Growth
Developed International	1.4	2.4	3.8
Europe ex-UK	2.1	2.8	4.8
UK	-2.3	2.1	-0.3
Japan	1.5	2.1	3.6
Pacific ex-Japan	1.4	2.5	3.9
Canada	3.0	1.9	4.7

Source: Bloomberg. MSCI Indices (World ex-US, France, Germany, Switzerland, Netherlands, Sweden, Spain, Italy, UK, Japan, Australia, Hong Kong, Singapore, Canada). Returns in USD. Data from January 1999 to December 2020.

In comparison to the US, cyclical adjustments to earnings growth over the next ten years are substantially greater for developed international stocks. In particular, Europe stands out with the largest acceleration in earnings growth, in part due to European economies and equities being relatively more cyclical than others. Naturally, as economic growth improves, earnings across developed international markets tend to experience the greatest improvements in the near to medium term.

Emerging Markets

EXHIBIT 26

Expected Real Growth Rates by Region

	Trend Growth	Reversion to Trend	10-Year Growth
Emerging Markets	4.1	2.4	6.5
EM Asia	5.2	2.0	7.1
EM EMEA	-3.8	4.6	0.8
EM Latin America	-3.0	6.8	3.8

Source: Bloomberg. MSCI Indices (Emerging Markets, South Korea, Taiwan, China, India, Brazil, South Africa, and Russia), Returns in USD. Data from January 1999 to December 2020.

Within emerging markets, the greatest cyclical adjustments are within EMEA and Latin America. These high-beta regions tend to be dependent on exports of raw commodities and are therefore sensitive to changes in global demand. Cyclical adjustments to earnings are the smallest within EM Asia, notably China, South Korea, and Taiwan, which have overall been a net beneficiary of the pandemic and have experienced relatively resilient earnings growth in 2020. In comparison, India has exhibited greater sensitivity to cyclical swings, and is expected to experience a more sizable pickup in growth rates, as earnings mean revert to long-term trend.

Valuation (Repricing)

Finally, we incorporate into our strategic equity return forecasts any potential repricing effects, i.e., expected changes in valuations annualized over the next decade.

In our prior years' capital market assumptions framework, we used the cyclically adjusted price-to-earnings ratio (CAPE) ratio, proposed by Robert Shiller and John Campbell in a 1988 paper[9] as our measure of equity valuations.

We would then solve for the potential repricing effects by assuming that current valuation levels would mean revert to long-term medians (from 1999 to present) over the next 10-year period. Specifically, the repricing effect represents the expected capital gains/losses as a result of valuation mean reversion.

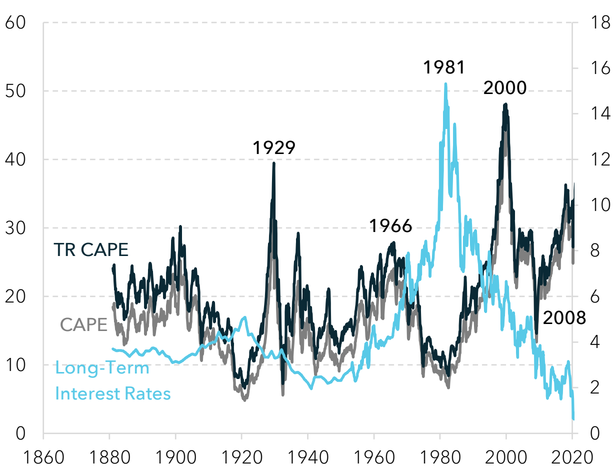
The intuition behind this approach is the belief that, all else being equal, the higher the current purchase price of an asset, the lower its prospective return potential. The implicit notion is that the expensiveness or cheapness of an asset is defined as current valuation relative to its historical levels. This is not a provocative notion by any means. Valuation measures such as price-to-earnings or P/E multiples have in many cases exhibited strong predictive power of future returns over the medium to long term, i.e., ten years.

EXHIBIT 27

S&P 500 CAPE Ratios 1850 – 2020

Left Axis: CAPE & Alternative Total Return CAPE

Right Axis: Long-Term Interest Rates



Source: Robert Shiller's website. Data from January 1881 to December 2020.

Rather than measuring valuations using the more commonly used metrics such as forward or trailing 12-month price multiples, we chose the CAPE ratio, which adjusts for the cyclical effects on equity earnings. Specifically, the CAPE ratio is calculated by dividing the current market price by trailing 10-year average of inflation-adjusted earnings per share.

In addition, we also elected to use the alternative version of CAPE (referred to TR CAPE), which was introduced by Shiller in 2018 to correct for the effect of earnings growth skewed by share buyback (Robert Shiller's Website)[10]. The TR Cape Ratio overcomes this bias by assuming continuous reinvestments of dividends into share issuance and proportionally scaling up the prices and earnings per share.

The CAPE Ratio is a widely-accepted (and well-respected by many) metric for valuation. It successfully identified market peaks in 1929 and 2000, two of the greatest equity market bubbles in history. However, there are two major shortcomings associated with the CAPE ratio that have called its efficacy into question.

First, CAPE is backward looking by nature, and therefore is slow to adjust for the impact of structural composition changes in equity market indices, e.g., the S&P 500's increasing weightings to technology, communication services, and consumer discretionary sectors, all of which have relatively less cyclical earnings growth rates and higher price multiples relative to other sectors within the index.

Second, CAPE does not assess valuations by controlling for other key macro factors, notably changes in interest rates. This is especially important to note, because the continued downward trend in interest rates over the past two decades have substantially lifted asset prices and, correspondingly, CAPE ratios.

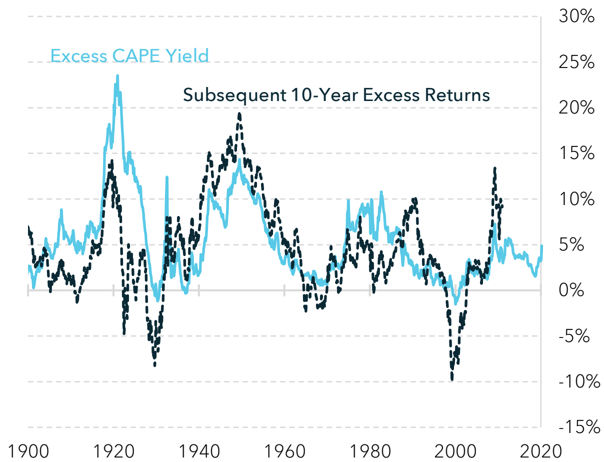
The first shortcoming is less critical for our purpose. We can adjust for it by apply varying degrees of mean reversion based on changes in index composition. In the case of the S&P 500, a structural increase in weightings to high multiple companies calls for a smaller degree of mean reversion. The second shortcoming, however, poses a greater challenge to our analysis.

Fundamentally, CAPE is a measure of absolute valuation. Inherently, market prices are determined by buyers and sellers. The essence of asset allocation refers to investors determining the optimal asset class weightings, partly based on their views on the relative attractiveness across asset classes. However, when valuations of asset classes across the board have all been significantly inflated by historic lower interest rates, how does one avoid owning assets which that they considered overvalued when everything else also appears expensive? Indeed, there is the option of divesting completely, however, the opportunity cost doing so can be quite significant. As history has shown repeatedly, bull markets can spend many years above fair value, and even a few years far above in the last stage of a market cycle.

The bottom line is that the CAPE ratio, absent extreme market environments, tends to exhibit a weak tendency to mean revert.

EXHIBIT 28

S&P 500 Excess CAPE Yield 1900 – 2020



Source: Robert Shiller's website. Data from January 1900 to December 2020.

As a result, we have modified our valuation or repricing framework by incorporating an additional valuation measure, the Excess CAPE Yield, or the ECY. Simply speaking, the ECY is the inversion of the TR CAPE ratio minus 10-year real interest rates. Although the actual methodology behind calculating the ECY is much more nuanced that it may appear, intuitively the ECY can be thought of as a more sophisticated version of equity risk premium. As illustrated in Exhibit 28, the ECY has shown a strong predictive power of excess equity returns of the S&P 500 over the medium to long term, i.e., ten years.

The motivation behind incorporating the ECY in addition to the CAPE is that the ECY is a measure of relative valuation, and inherently has a stronger tendency to mean revert, as investors can easily swap one asset for another without being out of the market.

Valuation (Repricing) Methodology

Our revised framework approaches the forecasting of future valuation changes via three steps, each of which focuses on one fundamental macro driver that influences asset valuation. The three factors are growth, real yield, and volatility.

i. Despite the interference of other variables such as interest rates, inherently the CAPE ratio is current price divided by earnings, and therefore reflects investors' optimism about future earnings growth. When the current CAPE ratio is significantly higher than historical levels, it may be an indication of excess investor optimism, which generally translates into lower prospective returns (over the medium to long term). Current CAPE ratios across various countries are on average at the 75% percentile relative to the last 20 years. The S&P 500 CAPE is currently at the 88th percentile. In our view, the higher the percentile, the more likely that investors are overly optimistic about future earnings growth potential. The relationship, however, is not linear. As a result, we solve for the potential repricing effect driven by the normalization of growth expectation by assuming a 50% (as opposed to 100%) mean reversion of CAPE to long-term median.

ii. As we alluded to earlier, another critical variable that has substantially lifted equity valuations is historically low long-term real rates. In fact, current long-term real rates (the difference between current nominal rates and annualized inflation over the past ten years) within developed economies are, on average, at the 4th percentile relative to the past 20 years. One of our high conviction themes for the next decade, as discussed at the beginning of this paper, is that real rates in developed countries are expected to rise but by only to a modest degree in the coming years, driven by central banks' intention to monetize national debt. Correspondingly, we solve for the potential repricing effectively caused by a partial normalization of rates by assuming real rates in developed countries rise to the 25th percentile of historical levels. For the US, this translates into 10-year real rates rising by 1% (to around zero) over the next decade.

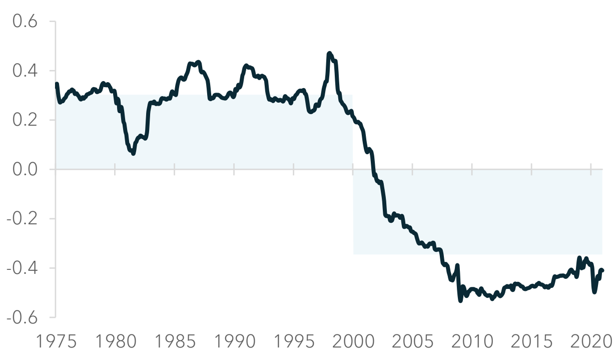
iii. In terms of relative valuation, equities across the board appear fairly attractive versus fixed rate long-term sovereign debt. This is particularly pronounced in developed markets countries, where long-term nominal rates continue to remain somewhat anchored. Current ECY across developed countries are on average over the 70th percentile relative to the last 20 years. As economic outlook continues to improve and earnings growth becomes more abundant across countries and sectors, we expect the equity risk premium to compress modestly from current levels. We solve for the potential repricing effect by assuming that the current ECY levels mean revert to long-term medians.

Among the three repricing effects driven by (1) changes in growth expectations, (2) real rates normalization, and (3) a decrease in uncertainty around equity returns relative to bonds, the first two represent changes in absolute valuations, whereas the third reflects changes in relative valuations.

As growth expectations continue to improve as we recover from the pandemic-induced economic recession, we believe the that the greatest risk to equity valuations as well as bond valuations in the medium term is a greater than expected rise in real rates. What this implies is that the correlation between equities and bonds may be higher than the historic average, due to their sensitivities to changes in real rates, especially since current rates sit at historic lows.

EXHIBIT 29

Rolling 10-Year Correlation of US Equities versus US Treasuries



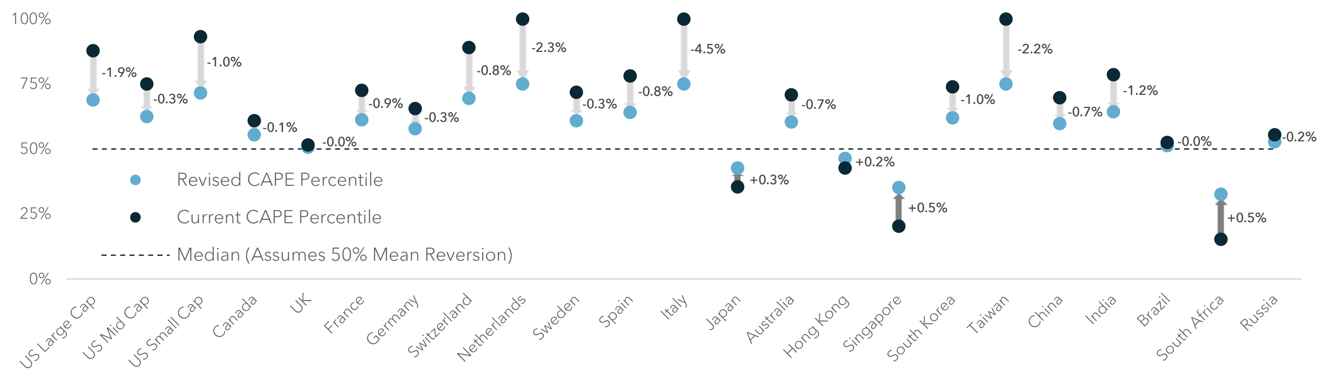
Source: Bloomberg. S&P 500 Index, US 10-Year Treasuries (returns proxied based on changes in nominal yields and durations).

Note: blue shared area represents average correlations before and after 2000. Data from 1975 to 2020.

As a result, over the medium term, we believe absolute valuations are likely to be more influential than relative valuations. Correspondingly, we take the worst of the first two repricing effects (which are from the perspective of absolute valuations), and calculate a blended repricing effect, by assigning a 75% weight to changes in absolute valuation, and a 25% weight to changes in relative valuation.

Exhibit 30

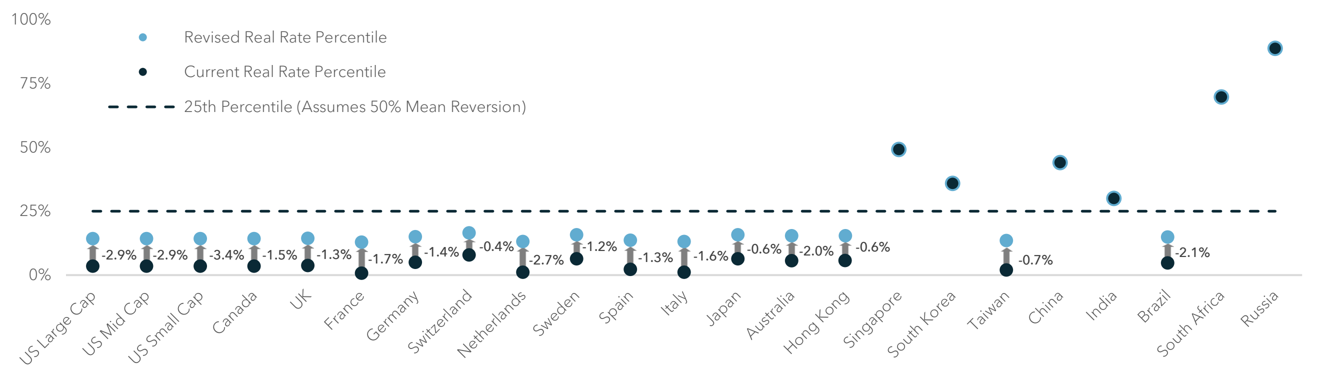
Current versus Revised TR CAPE Ratio Percentiles



Source: Bloomberg. Data from January 1999 to December 2020.

Exhibit 31

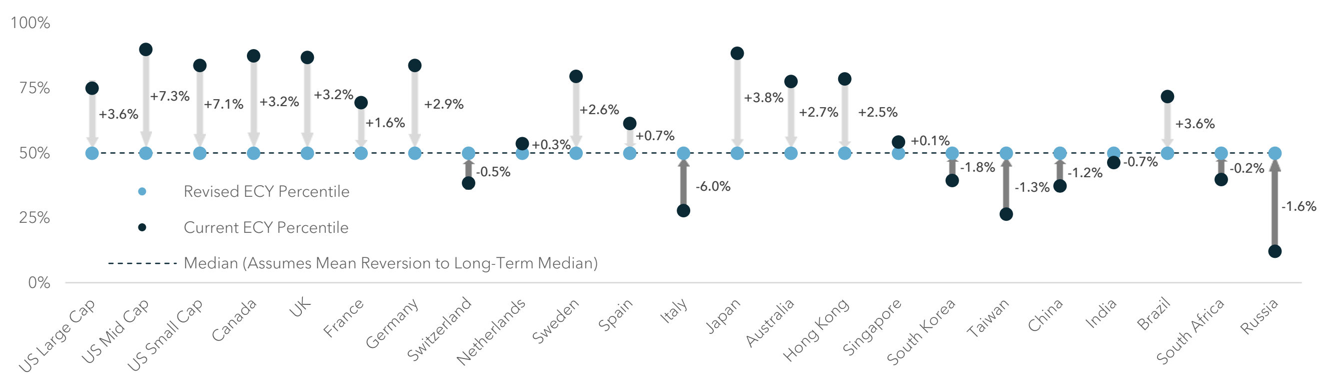
Current versus Revised Real Rate Percentiles



Source: Bloomberg. Data from January 1999 to December 2020.

Exhibit 32

Current versus Revised ECY (Excess TR CAPE Yield) Percentiles



Source: Bloomberg. Data from January 1999 to December 2020.

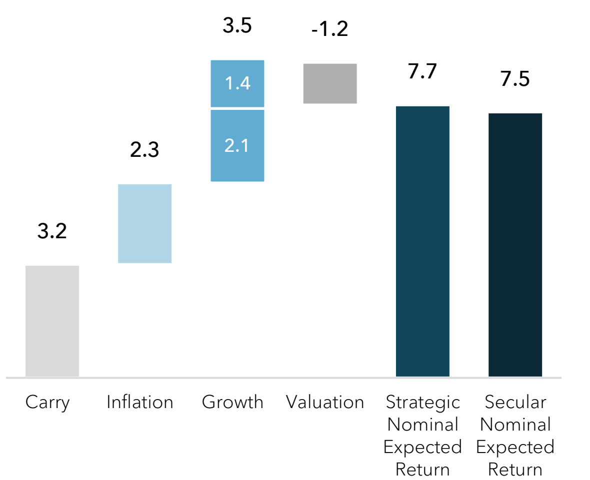
Public Equities Return Forecasts in Details

United States

EXHIBIT 33

S&P 500

Expected Nominal Return Breakdown (%)



The "growth" component of the strategic nominal expected return is a combination of long-term real growth (bottom) and a cyclical growth adjustment (top).

EXHIBIT 34

Expected Strategic Nominal Return Breakdown (%)

	Carry	Inflation	Growth	Valuation	Excess Risk Premium	**Strategic Nominal Expected Return**
US All Cap	2.9	2.3	3.8	-1.1	0.1	**7.9**
Large Cap	3.2	2.3	3.5	-1.2	-	**7.7**
Mid Cap	2.2	2.3	4.9	-0.4	-	**9.0**
Small Cap	0.1	2.3	7.2	-0.7	1.0	**9.8**

S&P 500 Index, S&P Midcap 400 Index, and Russell 2000 Index.

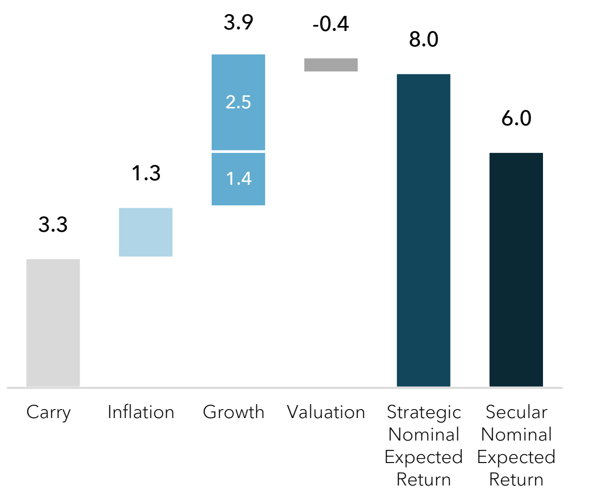
The "growth" component of the strategic nominal expected return is a combination of long-term real growth and a cyclical growth adjustment.

Developed International

EXHIBIT 35

MSCI World Ex-US

Expected Nominal Return Breakdown (%)



Returns in USD. The "growth" component of the strategic nominal expected return is a combination of long-term real growth (bottom) and a cyclical growth adjustment (top).

EXHIBIT 36

Expected Strategic Nominal Return Breakdown (%)

	Carry	Inflation	Growth	Valuation	**Strategic Nominal Expected Return**
Developed Int'l Ex-US	3.3	1.3	3.9	-0.4	**8.0**
Europe Ex-UK	3.2	1.0	4.9	-1.0	**8.1**
UK	4.7	3.1	-0.2	-0.2	**7.4**
Japan	2.7	0.5	3.6	0.5	**7.3**
Pacific ex-Japan	3.6	1.8	3.9	-0.5	**8.8**
Canada	2.8	1.6	4.6	-0.3	**8.8**

MSCI Indices (World ex-US, France, Germany, Switzerland, Netherlands, Sweden, Spain, Italy, UK, Japan, Australia, Hong Kong, Singapore, Canada). Returns in USD.

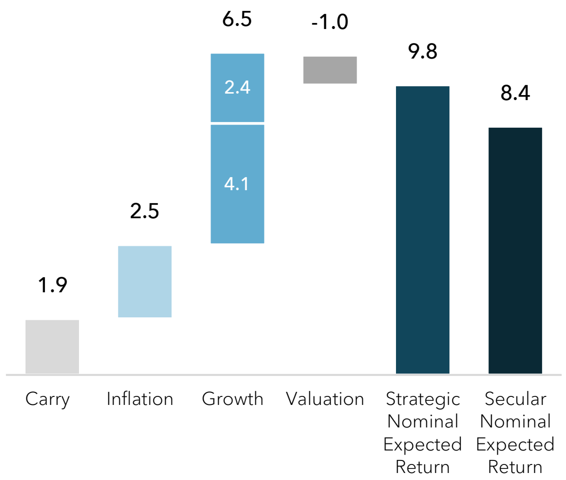
The "growth" component of the strategic nominal expected return is a combination of long-term real growth and a cyclical growth adjustment.

Emerging Markets

EXHIBIT 37

MSCI Emerging Markets

Expected Nominal Return Breakdown (%)



Returns in USD. The "growth" component of the strategic nominal expected return is a combination of long-term real growth (bottom) and a cyclical growth adjustment (top).

EXHIBIT 38

Expected Strategic Nominal Return Breakdown (%)

	Carry	Inflation	Growth	Valuation	Strategic Nominal Expected Return
Emerging Markets	1.9	2.5	6.5	-1.0	**9.8**
EM Asia	1.8	2.2	7.2	-1.1	**10.0**
EM EMEA	3.4	4.5	0.8	-0.3	**8.4**
EM Latin America	1.5	3.5	3.8	-0.7	**8.2**

MSCI Indices (Emerging Markets, South Korea, Taiwan, China, India, Brazil, South Africa, and Russia). Returns in USD.

The "growth" component of the strategic nominal expected return is a combination of long-term real growth and a cyclical growth adjustment.

Public Equities Index Composition

Developed International

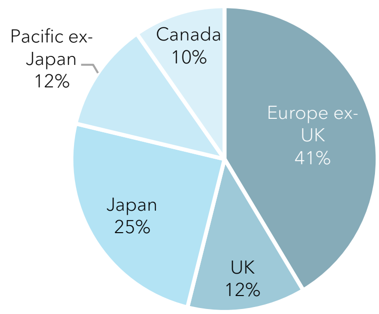
Note on Index Composition:

To account for evolving index composition over the past decades and to provide the flexibility and transparency for country-specific discussion in our analyses, we apply our expected-return methodology by assessing the major constituent countries within the MSCI World ex-US index independently and then aggregating the results on the index level.

EXHIBIT 39

MSCI World ex-US Index Breakdown by Country

Region	Main Constituent Countries	Weight %
Europe ex-UK	France, Germany, Switzerland, Netherlands, Sweden, Spain, Italy	41
UK	UK	12
Japan	Japan	25
Pacific ex-Japan	Australia, Hong Kong, Singapore	12
Canada	Canada	10



Source: Bloomberg. MSCI World ex-US Index; Data as of December 2020. Weight percentages have been scaled up minimally, so the total percentages add up to 100%. Israel has been excluded from the table above due to the region's comparatively small market capitalization.

Emerging Markets

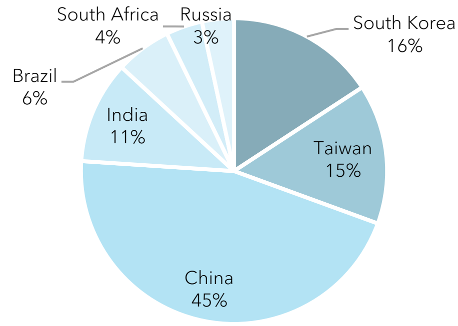
Note on Index Composition:

The country weights for the MSCI Emerging Markets index have evolved considerably over the past 20 years. In 1988, Malaysia and Brazil accounted for 34% and 19% of the index, respectively. China was not introduced into the index until 1996. Since then, its weight has increased from 0.5% to over one-third of the index. To account for the evolving index composition, we apply our expected-return methodology by assessing the top constituent countries within the MSCI EM index independently and then aggregating the results on the index level based on the current country weights. Note that the top constituent countries account for 84% of the index. We scale up their respective weights such that the total weights add up to 100%; we then use the scaled weights in our aggregate calculations.

EXHIBIT 40

MSCI EM Index Breakdown by Country

Main Country Constituents	Original Weight %	Scaled Weight %
South Korea	13	16
Taiwan	13	15
China	38	45
India	9	11
Brazil	5	6
South Africa	3	4
Russia	3	3
Total	84	100



Source: Bloomberg. MSCI Emerging Markets Index; Data as of December 2020. Original weight percentages across the top seven constituent countries add up to 84%. The percentages have been scaled up such that the total scaled weight percentages add up to 100%. Note that the current weights do not account for potential increase in inclusion of China A share in the MSCI EM index.

Currency Impact

For non-US equities, our expected real returns are US dollar-based, implying no currency hedging from the perspective of a US investor. We believe that currency hedging should be an investment decision applied separately at the portfolio level based on investor-specific circumstances and the tactical macro outlook.

Unhedged dollar-based real returns can be decomposed into real returns in local currencies and changes in foreign exchange rates. Over the period of 2000 to 2020, the US dollar weakened against major world currencies, with significant depreciation over the first decade and substantial appreciation over the second decade (with a sizable reversal in 2020). This would somewhat augment our expected real returns for foreign equities, which include certain backward-looking indicators as inputs.

Exhibit 41

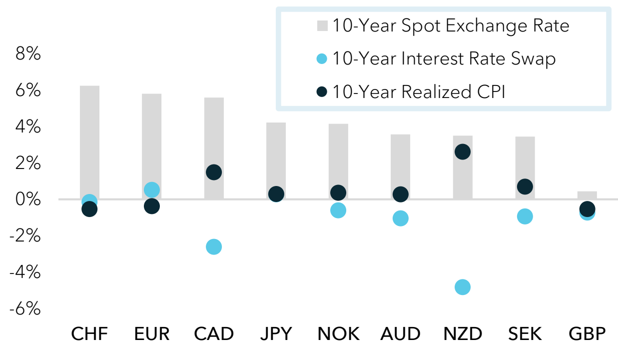
US Dollar Index % Return

2000 - 2010	-24.4%
2010 - 2020	13.2%
2000 - 2020	**-14.5%**

Source: Bloomberg. the US Dollar Index (DXY). Data from January 2000 to December 2020.

Exhibit 42

Annualized Returns of G10 vs. USD 2000-2010

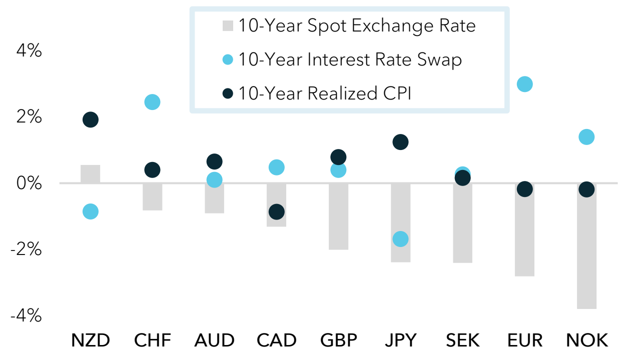


Source: Bloomberg. Data from January 2000 to December 2020.

Over the period of 2000 to 2010, G10 currencies with the greatest appreciation (CHF) against USD generally displayed near zero average interest-rate differentials. Similar observations apply to nearly all other currencies considered, with the exception of CAD and NZD.

Exhibit 43

Annualized Returns of G10 vs. USD 2010-2020



Source: Bloomberg. Data from January 2000 to December 2020.

Over the period of 2010 to 2020, the relationship between yields and foreign exchange rates continues to appear weak, if nonexistent. Among G10 currencies that displayed the most positive interest-rate differentials, only NZD appreciated against the US dollar (by a modest amount), whereas GBP and JPY depreciated significantly. G10 currencies that depreciated the most against the US dollar, i.e., NOK, EUR and SEK, all displayed near-zero interest rate differentials.

The observed positive correlation between currency yields and currency spot prices has long been used to explain the profitability of currency carry strategies. We believe that, although the relationship between interest rate differentials and currency exchange rates dominates in the short term, it has the tendency to reverse quickly during a risk-off environment.

We have found that inflation rates, which tend to be more persistent than short-term interest rates, exhibit stronger predictive power of currency exchange rates over the long term. Fundamentally, currency exchange rates should reflect inflation differentials based on purchasing-power parity. The correlation between interest rates and currency exchange rates is an observed effect of monetary policies. Central banks generally increase short-term interest rates to overcome high inflation and to alleviate inflation-induced downward pressure on the country's currency. This relationship may strengthen in the current macro environment, given central banks' pro-inflation bias and commitment to keep nominal rates anchored in an effort to reduce interest burden following historic increases in national debt.

TRADITIONAL FIXED INCOME

Our 10-year strategic outlook for traditional fixed income securities such as Treasuries, corporate bonds, and munis are traditionally comprised of three components: initial nominal yields, roll yields, and expected losses from short optionality and credit losses. In this year's paper, we include an additional adjustment to account for the potential effects of an upward shift in nominal yield curves on prospective returns. This additional adjustment is driven by our assumptions, as discussed in depth at the beginning of this paper, of a higher inflation regime in the medium term and a rise in long-term real rates.

2021 Expected Long-Term Nominal Returns for Traditional Fixed Income[i] (%)

TABLE 2

	Strategic	*Secular*	*Historical*		
	(10-Year)	*(Equilibrium)*	Past 20 Years	Past 15 Years	Past 10 Years
Ultra-Short Fixed Income	1.1	2.3	1.5	1.2	0.6
Tax Exempt Municipal Bonds[ii]					
Tax Exempt Inv. Grade – Short Term	2.0	2.5	2.6	2.4	1.6
Tax Exempt Inv. Grade – Intermediate Term	1.8	3.1	4.6	4.4	4.1
Tax Exempt Inv. Grade – Long Term	1.3	3.5	5.5	5.2	6.0
Tax Exempt High Yield Muni	3.2	5.4	5.9	5.4	6.9
US Taxable Fixed Income					
US Taxable Inv. Grade – Short Term	2.0	2.4	3.0	2.6	1.6
Short Term Treasury	*1.9*	*2.3*	*2.6*	*2.2*	*1.3*
Short Term Corporate	*2.1*	*2.5*	*3.8*	*3.5*	*2.6*
Short Term Securitized	*2.2*	*2.7*	*2.8*	*2.4*	*1.4*
US Taxable Inv. Grade – Intermediate Term	2.5	3.6	4.6	4.3	3.4
Intermediate Term Treasury	*1.9*	*3.1*	*4.5*	*4.3*	*3.3*
Intermediate Term Corporate	*2.6*	*3.8*	*6.0*	*5.6*	*5.3*
Intermediate Term Securitized	*3.0*	*3.8*	*4.3*	*3.9*	*2.8*
US Taxable Inv. Grade – Long Term	0.3	3.3	7.4	7.1	8.0
Long Term Treasury	*-0.4*	*2.9*	*7.2*	*7.1*	*7.9*
Long Term Corporate	*0.8*	*3.6*	*8.0*	*7.6*	*8.3*
US Taxable High Yield Corporate	4.1	5.1	7.8	7.5	6.8
US Preferreds	5.3	6.1	7.4	7.4	7.4
US TIPS	2.4	3.0	5.4	4.3	3.8
Developed International Fixed Income	1.2	3.0	4.5	4.3	4.4
Emerging Markets Fixed Income					
EM Sovereign Debt – Hard Currency	4.0	6.2	8.5	6.9	6.2
EM Sovereign Debt – Local Currency	4.7	6.1	3.3	3.3	1.4

[i] Annualized returns (geometric averages).
[ii] Not adjusted for taxable equivalent.

Methodology

For debt instruments such as US Treasuries that are generally considered to have minimal credit risk (thus conventionally referred to as "risk free"[i]), we find that initial nominal yields and roll yields (i.e., price appreciation/depreciation from rolling down upward/downward sloping yield curves) are strongly predictive of long-term expected nominal returns.

"Risk-Free" US Treasuries' 10-Year Expected Nominal Return = Initial Nominal Yield + Roll Yield

For bonds with higher yields over risk-free (e.g., US corporate bonds and EM hard currency sovereign debt), we follow the framework outlined by Ilmanen and decompose raw yield spreads over risk-free into (1) expected losses from short optionality, (2) expected credit losses due to defaults and downgrades, and (3) risk premia or ex-ante excess returns over Treasuries. Note: for non-USD-denominated bonds such as EM local currency sovereign debt, we apply a further adjustment to account for the inflation-rate differential between the US and the local country, as bonds with the same sovereign issuer should have comparable real yields across different currencies.

Higher-Yielding Bonds' 10-Year Expected Nominal Return = Initial Yield + Roll Yield – Expected Losses

For ultra-short fixed income (e.g., 90-day T-Bills), we forecast the 10-year expected nominal return based on 10-year Treasury yield and estimated term premium.

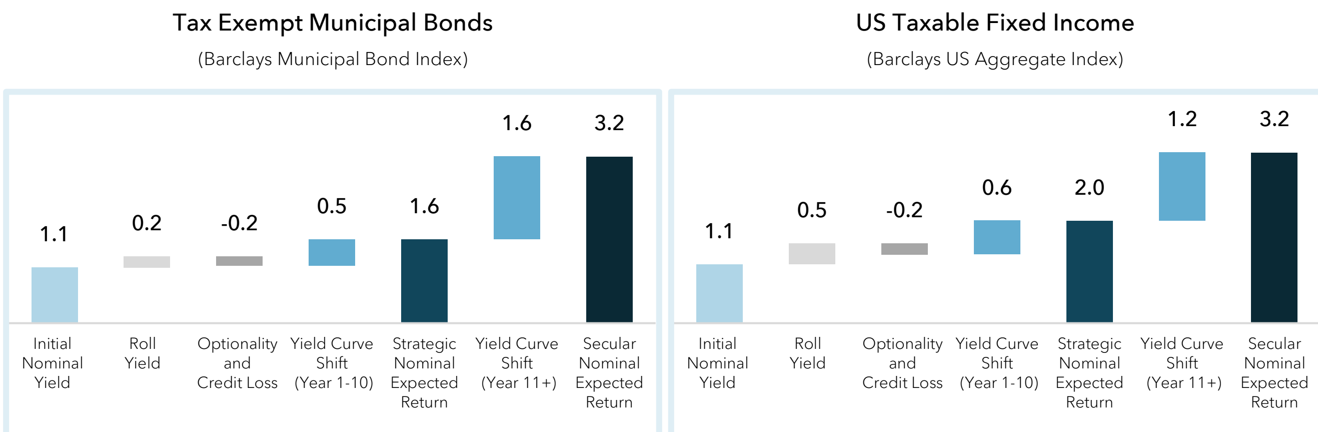
Ultra-Short's 10-Year Expected Nominal Return = Expected 10-Year Treasury Yield – Term Premium

Lastly, for US inflation-adjusted bonds (i.e., TIPS), we estimate the 10-year expected nominal return based on initial real yields, roll yields (real), and our estimated 10-year inflation rate.

TIPS' 10-Year Expected Nominal Return = Initial Real Yield + Roll Yield + Estimated 10-Year Inflation

EXHIBIT 44

Expected Nominal Return Breakdown (%)



[i] US Treasuries are also subject to other types of risk, notably duration risk and inflation risk.

Initial Nominal Yields

We have found that initial nominal yields provide relatively transparent information on prospective average nominal returns over a long time horizon, particularly for high quality, intermediate-to-long-term bonds.

This observation is fairly intuitive. Initial nominal yield is the yield that an investor locks in throughout the life of a bond, assuming that the bond is held to maturity. (We assume here that the impact of changes to future reinvestment rates on the coupons is relatively small.)

The "buy and hold" intuition is fundamentally the same as the concept behind an alternative scenario in which the investor sells a bond prior to its maturity and purchases a different bond of similar credit quality and duration but of a different nominal yield (due to movements in rates or spreads). The capital gains or losses from the sale and the difference in future carry are expected to offset each other over a sufficiently long holding period.

Over the short term, the effect of price change dominates: rising or falling yields cause price depreciation or appreciation which is observed immediately. While rising or falling yields also translate into higher or lower future carry, the offsetting effect is not fully captured in the exhibits below as the carry differential requires accrual over a longer time horizon.

To assess the strength of the relationship, we regress annualized 10-year nominal returns of three broad-based fixed income indices with zero-to-low credit risk against their initial nominal yields at the beginning of the corresponding 10-year rolling periods.

The regression results confirm that current nominal yield is a strong predictor of future long-term nominal return.

Note that the first rolling period in our regression analysis begins in January 1980 and the last rolling period ends in December 2020. The level and the shape of the US Treasury yield curve have both moved significantly over the multi-decade period. Yet, the predictability is found to be statistically significant and meaningful across varying levels of yields.

The predictability appears to be strongest in the case of investment grade municipal bonds. One explanation for this may be that the nominal yields of municipal bonds have historically exhibited lower volatility. This creates greater consistency between initial nominal yields and future reinvestment rates for principal and coupon payments during each 10-year rolling period.

EXHIBIT 45

Realized Annualized Returns Over the Next 1 Year vs. Initial Nominal Yields

Horizontal Axis: Initial Nominal Yield

Vertical Axis: Total Return over the Subsequent Year

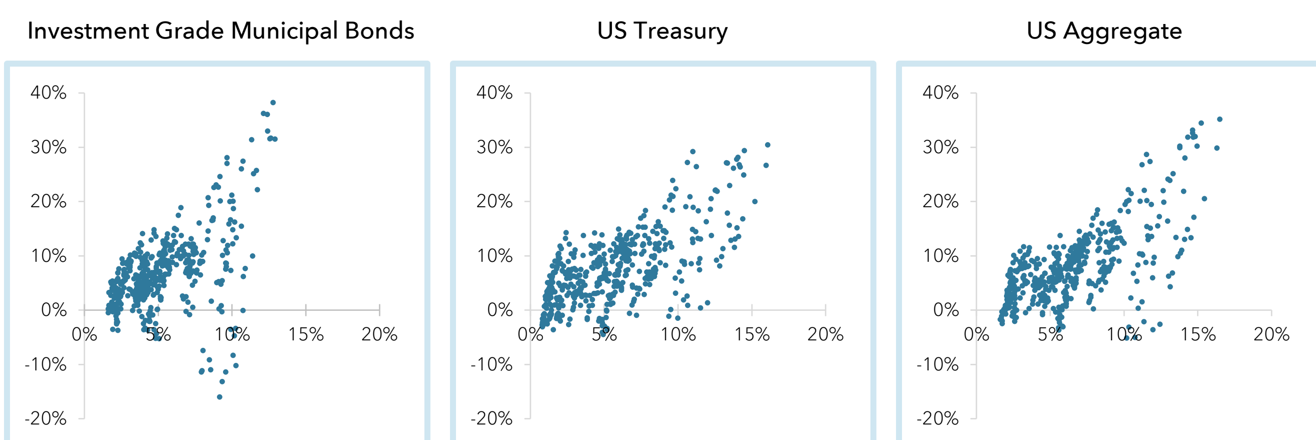
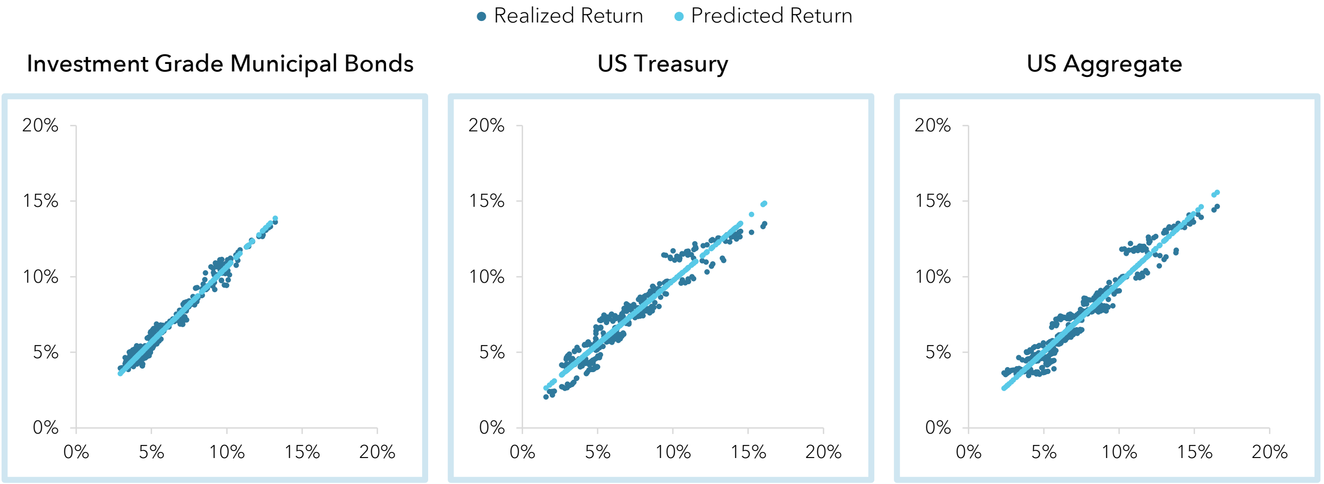


EXHIBIT 46

Realized Annualized Returns Over the Next 10 Year vs. Initial Nominal Yields



Investment Grade Municipal Bonds	US Treasury	US Aggregate
Coefficient = 0.9964	Coefficient = 0.8413	Coefficient = 0.9168
Intercept = 0.71%	Intercept = 1.36%	Intercept = 0.48%
R^2 = 0.97	R^2 = 0.93	R^2 = 0.94
Standard Error = 0.41%	Standard Error = 0.74%	Standard Error = 0.70%

Source: Bloomberg. Barclays Municipal Bonds Index, Barclays US Treasury Total Return Index, Barclays US Aggregate Bond Index. Data from January 1980 to December 2020.

While the predictability of initial nominal yields exhibits strong statistical significance, the levels of standard errors indicate that there remains substantial uncertainty in the 10-year returns predicted by initial nominal yields in comparison to observed realized returns. This is partially attributable to the dispersion of maturities or durations within the selected indices.

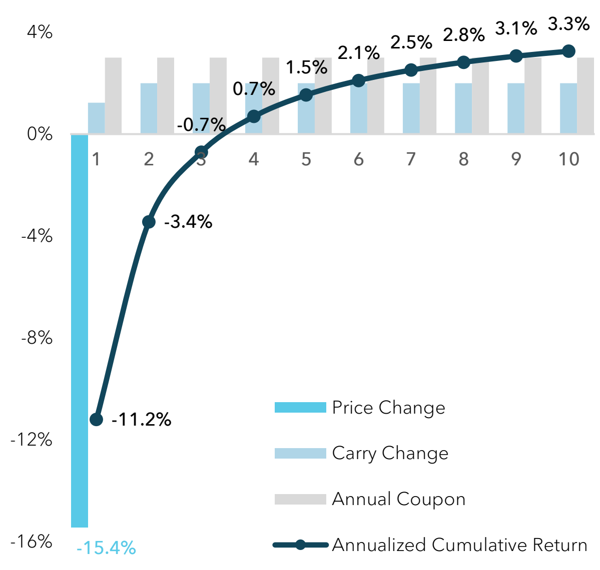
We find that the length of the "breakeven period" required for the effect of price change and the effect of change in future carry to fully offset is roughly bounded by a bond's duration and years to maturity.

We illustrate this using a simple example. A 10-year bond with a 3% annual coupon and a nominal yield of 3% is purchased at par. The duration of the bond is 9 years. Assuming a flat yield curve, we assess impact on the annualized cumulative total returns of the bond over the subsequent 10 years if the nominal yield rises to 5% immediately after the bond is purchased.

We find that the breakeven period – the amount of time it takes for the annualized cumulative total return to converge to the initial nominal yield of 3% – is just below nine years and roughly equal to the initial duration of the bond.

EXHIBIT 47

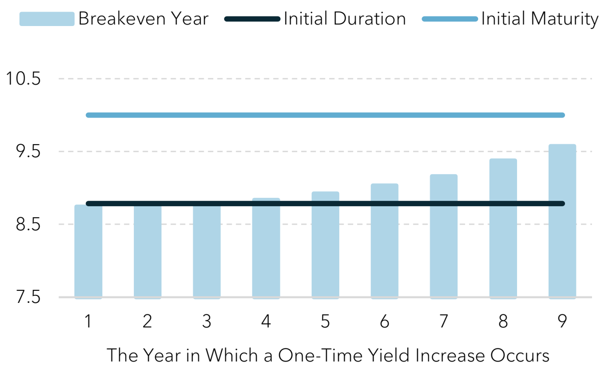
Realized Returns Following a One-Time Yield Rise



We confirm the strength of the relationship by examining the effect of postponing the timing of the one-time yield rise: the ending point of the breakeven period of a bond extends correspondingly further into the future but remains bounded by the bond's maturity date.

EXHIBIT 48

Breakeven Period Bounded by Maturity



Based on this finding, we conclude that the predictability of current nominal yields is expected to be somewhat weaker for bonds with very long durations, as the accrual of future carry change during the 10-year forecast time horizon does not sufficiently offset the immediate price change.

Similarly, current nominal yields are probably not very strong predictors of 10-year future returns for bonds with very short durations, as the breakeven periods overlap with only the initial portion of the forecast time horizon. Returns over the remaining years are determined by the future nominal yields observed at the end of the breakeven periods.

For bonds with durations and/or maturities reasonably aligned around the length of our forecast time horizon, the predictability power of current nominal yields is the strongest. As illustrated previously, the ending annualized cumulative total returns on a 10-year maturity bond – despite very large fluctuations in rates throughout the 10-year period – demonstrate strong convergence to the initial nominal yield.

In summary, if interest rates rise throughout the next 10 years, current nominal yields will underestimate future returns for shorter-term bonds and overestimate future returns for longer-term bonds. For broad-based indices such as the Barclays US Treasury Index, which has an overall modified duration of over seven years, the effects of overestimates and underestimates are expected to largely offset one another.

EXHIBIT 49

Annualized 10-Year Cumulative Return Converges to Initial Nominal Yield in Year 10

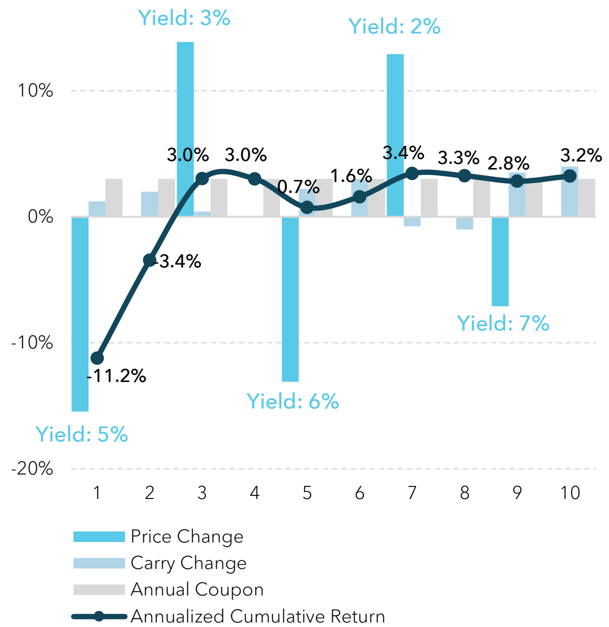
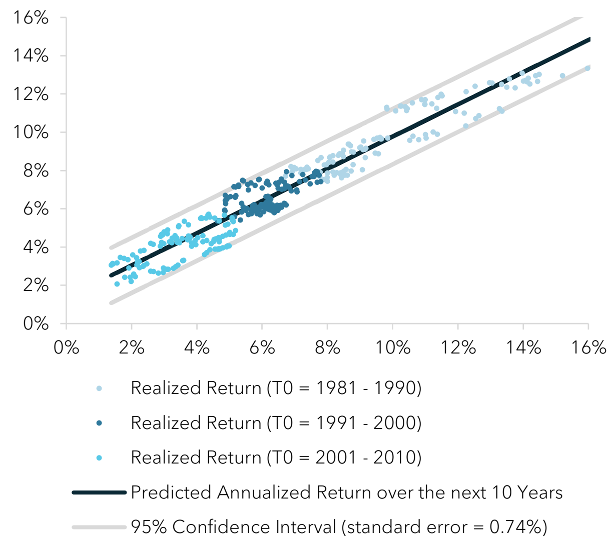


EXHIBIT 50

Regression Standard Errors (US Treasury)

Horizontal Axis: Nominal Yield of US Treasury at T_0 (T_0 from 1981 to 2020)

Vertical Axis: Return over the next 10 years



Source: Bloomberg. Barclays US Treasury Total Return Index. Data from January 1981 to December 2020.

Despite the shortcomings already discussed of using initial nominal yields as a predictor for 10-year future returns, the magnitude of standard errors found in the predicted 10-year returns for the Barclays US Treasury Index has been relatively consistent on an absolute basis across the range of observed nominal yields from 1981 to 2010.

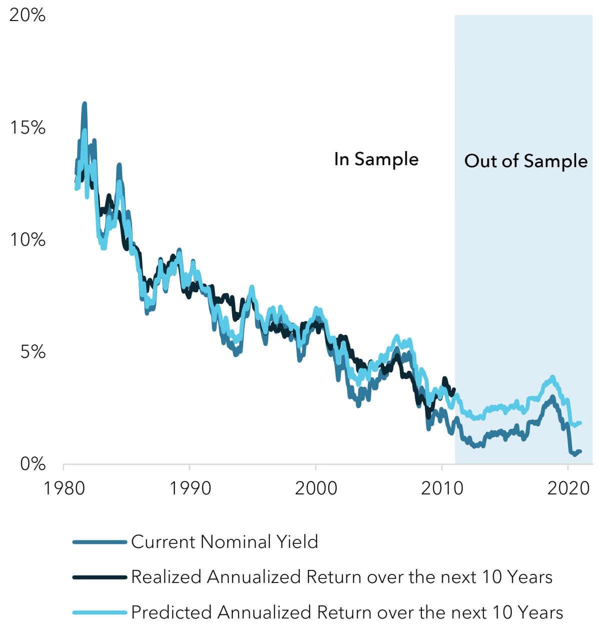
The in-sample results are regressed on initial nominal yields during a period prior to the present era of accommodative monetary policies and abnormally low interest rates.

EXHIBIT 51

Out-of-Sample Predicted 10-Year Annualized Returns (US Treasury Yields)

In-Sample: January 1981 – December 2010

Out-of-Sample: December 2010 – December 2020



Source: Bloomberg. Barclays US Treasury Total Return Index. Data from January 1981 to December 2020.

Given today's low-to-negative government bond yields across major developed countries, anchoring US Treasury yields, the magnitude of standard errors in our out-of-sample long-term return forecasts is expected to be greater on a percentage basis compared to the magnitude of standard errors in the in-sample results.

Roll Yields

Most fixed income strategies maintain a relatively stable duration over time. We incorporate this assumption into our fixed-income return forecast methodology.

In an example where yields remain somewhat consistent, in order to maintain a stable duration, an investor who buys a 10-year bond may be expected to sell it after one year – as the bond ages and becomes a 9-year bond – and to replace it with a comparable 10-year bond.

Correspondingly, we adjust our expected long-term returns by adding a second component: the expected incremental price appreciation of bonds as they "roll down the yield curve." (We assume price appreciation here because yield curves are generally upward sloping. Roll yields can be negative in the case of inverted yield curves.)

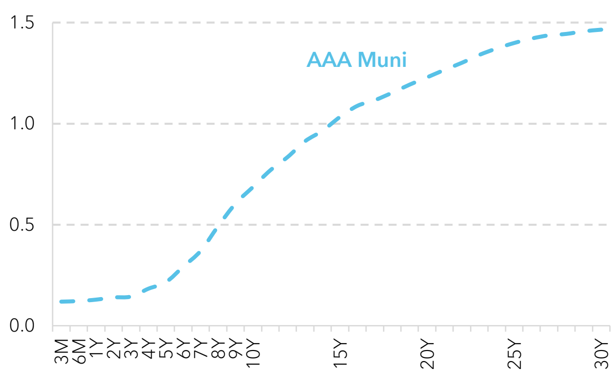
The intuition behind "roll yield" comes from the fact that as bonds age, their years to maturity decrease over time. Given upward-sloping yield curves, such bonds are expected to be revalued over time at increasingly lower yields – and higher prices.

The amount of roll yield expected is a function of the steepness of yield curves and the duration of bonds. Longer duration implies greater price appreciation given an equal amount of decrease in yield.

The AAA muni yield curve slope suggests that bonds with maturities between 7-year and 15-year may be most attractive in terms of roll yield potential.

Exhibit 52

Investment Grade Municipal Bond Yield %



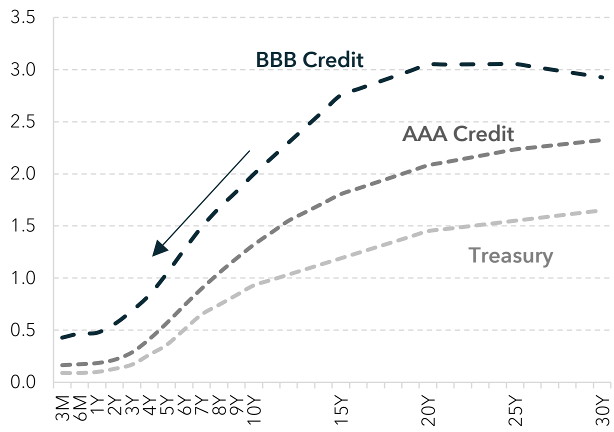
Sources: Bloomberg; Data as of December 2020.

Relative to the AAA muni yield curve, the US Treasury and corporate bond yield curves are noticeably steeper. We expect potential roll yields to be the greatest for maturities between 5 years and 15 years.

Note that these examples are based on market data as of the end of 2020. They primarily serve as contextual information for illustrative purposes as we explain our methodology for calculating prospective roll yields.

Exhibit 53

US Taxable Investment Grade Bond Yield %



Sources: Bloomberg; Data as of December 2020.

To compute the expected roll yield for a fixed-income asset class, we calculate the expected roll yields for individual bonds within the corresponding benchmark index and then aggregate the yields at the index level.

We first reprice each bond using its current nominal yield and years to maturity minus one. The new price obtained represents the future value of the bond in one year assuming a flat yield curve (no roll-yield effect). We carry out this step to remove the effect of amortization. (If a bond is currently priced at a premium or discount to par, the new price should be different from its current price due to amortization. The new price is the appropriate input for estimating roll yields.)

We then reprice the bond again, this time with an interpolated yield, which is obtained by subtracting the bond's current nominal yield from the yield curve delta at the corresponding tenor.

The percentage difference between the two hypothetical prices represents an estimate of the bond's future roll yield.

Note: We adjust years to maturity in our calculation to account for bonds with embedded callable options, such as mortgage-backed securities (MBS) and long-term municipal bonds, which constitute a large portion of the US investment grade bond market.

TABLE 3

Roll Yields (Expected Capital Gains) of US Investment Grade Tax Exempt and Taxable Bonds by Maturity

Tax Exempt Investment Grade Municipal Bonds[i]

Maturity Bucket	Average Maturity	Option-Adjusted Duration	Roll Yield %
1 - 2	1	1	0.01
2 - 4	3	3	0.05
4 - 6	5	4	0.17
6 - 8	7	5	0.37
8 - 12	9	5	0.41
12 - 17	14	6	0.30
17 - 22	19	6	0.18
22 +	27	8	0.12
Total	13	5	0.21

US Treasuries

Maturity Bucket	Average Maturity	Option-Adjusted Duration	Roll Yield %
1 - 3	2	2	0.03
3 - 5	4	4	0.26
5 – 7	6	6	0.66
7 - 10	9	8	0.71
10 – 15	10	8	0.67
15+	25	19	0.46
Total	8	7	0.33

US Investment Grade Corporate Bonds

Maturity Bucket	Average Maturity	Option-Adjusted Duration	Roll Yield %
1 - 3	2	2	0.08
3 - 5	4	4	0.45
5 – 7	6	5	0.91
7 - 10	9	7	1.10
10 – 15	12	10	1.31
15+	25	16	0.15
Total	12	9	0.49

Source: Bloomberg and Barclays Live. Barclays Municipal Bonds Index and Barclays US Aggregate Bond Index. Data as of December 2020.

[i] Not adjusted for taxable equivalent.

Beyond Risk-Free Bonds: Decomposing Yield Spreads

Fixed-income instruments such as corporate debt and asset backed securities trade at higher yields than comparable "risk-free" debt such as US Treasuries.

(For ease of reference, in this section we focus primarily on US fixed income asset classes. Developed international and emerging markets debt are discussed separately in the following two sections.)

While the justification for higher yields is often linked to credit risk, we feel that credit risk alone is an overly simplified explanation.

Antti Ilmanen (2011)[11] decomposes the raw yield spread between higher-yielding bonds and Treasuries into three parts: "the true ex ante return advantage and two break-even cushions that offset the expected impact of default losses and optionality."

Following the framework outlined by Ilmanen, we discuss in detail below the intuition behind the three components in the following order:

i. *Expected losses from short embedded options*

ii. *Expected credit losses due to defaults and downgrades*

iii. *Risk Premium (true excess returns over risk-free)*

For bonds with excess yields over risk-free rates, we adjust our expected long-term returns by incorporating a third component: a downward adjustment to the current nominal yields by the combined amount of expected losses from short embedded options and expected credit losses.

Expected Losses from Embedded Options

Bonds with embedded short-call options grant issuers the right to redeem bonds at par (or a predetermined price) prior to their stated maturity dates. If a bond is trading at a premium to par and gets unexpectedly called, the bondholders suffer a capital loss equal to the premium amount.

The prepayment option in mortgage-based securities (MBS) is somewhat similar to the embedded option in callable bonds, as both are more likely to be exercised during a time of declining interest rates, thus exposing bondholders to adverse changes in duration and greater reinvestment risk.

In the case of callable bonds, the timing of the option being exercised may be more idiosyncratic and harder to anticipate. The option value correlates also with improvement in issuer credit quality in addition to changes in interest rates.

Overall, to compensate for the expected losses from giving issuers and mortgage borrowers the optionality of earlier redemption dates, bondholders require a higher yield that equals their expected premium on the short options.

Expected Credit Losses

Credit risk – in the context of this paper – refers to the risk of a borrower defaulting on a debt by failing to make required principal or interest payments. From bondholders' perspective, credit risk represents lower expected future cash flows.

To compensate for the impact of such potential defaults, bondholders require a higher yield to offset their expected credit losses.

Credit Loss = Default Rate x (1 – Recovery Rate)

Recovery rate is mainly driven by debt seniority and varies moderately over time. The long-term average recovery rate for senior unsecured corporate bonds is approximately 40% across all credit ratings (Moody's 2020)[12].

Default rate, on the other hand, is highly sensitive to credit rating. Default rates among lower-rated bonds have also shown high volatility and cyclicality. The long-term average of default rates for global corporate bonds (the majority of which are issued by US companies) is 1.1% across all credit ratings.

In the absence of any embedded options, yield spreads of US corporate bonds over duration-adjusted Treasuries should represent the sum of investors' estimated future credit losses and the excess returns that investors expect to earn for choosing the riskier corporate bonds over comparable Treasuries.

Option-Adjusted Spreads (OAS) provide such measurement by removing the embedded options risk component from the corporate-Treasury yield spreads. (For ease of reference, we refer to option-adjusted spreads and credit spreads interchangeably throughout the rest of this paper.)

Based on data from 1994 to 2020, excess returns delivered by corporate bonds accounted for 49% of credit spreads for investment grade bonds and 54% for high yield bonds.

Exhibit 54

Recovery Rates and Default Rates by Rating

Global Corporates 1983 - 2020

Recovery Rate %: Senior Unsecured Bond

Default Rate %: Issuer-Weighted; Probability over One Year

Rating	*Recovery %*	*Default %*
AAA	N/A	0.00
AA	37	0.01
A	35	0.03
BBB	42	0.10
BB	43	0.52
B	37	2.00
CCC – C	38	6.12
Investment Grade	41	0.05
High Yield	38	2.63
All Ratings	38	1.05

Source: Moody's. Data as of December 2020.

Exhibit 55

Realized Excess Returns and Credit Losses

US Corporate Bonds, 1994 - 2020

	Investment Grade	*High Yield*
Option-Adjusted Spreads		
Average Spreads (bps)	139	505
Volatility (bps)	80	232
Excess Returns		
Annualized Average (bps)	68	275
Volatility (bps)	534	1250
Realized Credit Losses		
OAS – Excess Returns	70	230
Returns Earned as % of OAS	49	54
Credit Losses as % of OAS	51	46

Source: Bloomberg. Barclays US Treasury Total Return Index, Barclays US Corporate Bond Total Return Index, and Barclays US Corporate High Yield Total Return Index. Data from January 1994 to December 2020.

These figures, however, are quite sensitive to sampling-period selection, as implied by the high historical volatility figures of excess returns. If we exclude the most recent four years – a period during which corporate credit delivered outstanding excess returns mainly driven by spread compression – the long-term average of corporate credit excess returns as a percentage of credit spreads decreases to 38% for investment grade bonds and 47% for high yield bonds.

Investment-grade-rated corporate bonds have historically had near-zero default rates over a one-year horizon. However, our comparison of historical credit spreads and realized excess returns indicates that roughly 50% of option-adjusted credit spreads on US investment grade corporate bonds were not earned by bondholders due to credit losses. We reconcile this difference by identifying the different ways in which credit losses are captured based on investor types.

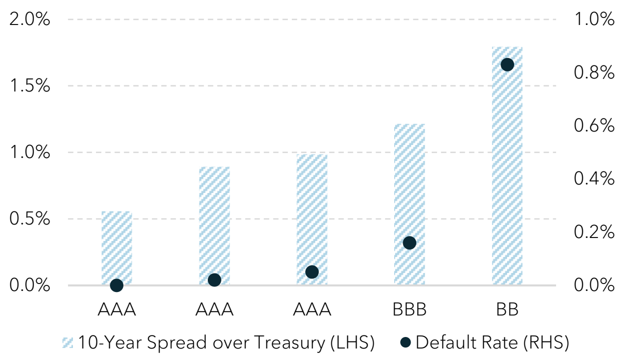
An investor who indiscriminately buys and holds corporate bonds across all credit ratings (effectively replicating the entire US corporate universe) should expect to realize credit losses only when defaults have occurred, with credit losses determined based on the initial purchase prices (typically par). In this case, we anticipate that the majority of credit losses will result from bonds rated CCC and below.

Investors who are restricted to the investment grade universe, however, are often forced to liquidate certain positions if the bonds have fallen out of the investment grade indices. Such investors may include insurance funds that need to adhere to regulatory constraints based on credit rating, as well as passive asset managers that track investment grade benchmarks (Bolognesi, Ferro and Zuccheri 2014)[13]. In many cases, downgrades and even just negative outlooks from rating agencies have an outsized effect on spreads across ratings (PIMCO 2018)[14]. In the case of "fallen angels" – bonds downgraded from BBB to BB – the effect of spread widening is further magnified due to selling pressure from institutional investors.

Thus, for investment grade bonds, credit losses are generally captured in the form of capital losses from spread widening due to (anticipated) rating downgrades as well as forced selling in the case of fallen angels. Such credit losses are acknowledged by bondholders and reflected in their demanded yields on investment grade bonds. As shown below, the differentials in credit spreads across AAA to BB are not proportional to the differentials in default rates, suggesting that investors' expected credit losses for bonds within a given credit rating are influenced by other factors (i.e., downgrading) that are not directly linked to default rates.

EXHIBIT 56

Default Rates Underestimate Credit Losses for Investment Grade Bonds

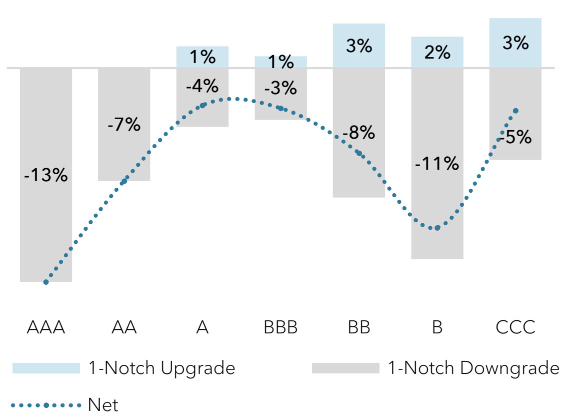


Source: Bloomberg and Moody's. Data as of December 2020.

The downgrading effect on investment grade bonds is expected to be persistent. One explanation for this is the asymmetrical rating migration among investment-grade bonds. While the chances of high yield bonds being upgraded or downgraded are sensitive to credit market cycles, the ratings of investment grade bonds tend to trend downwards over time.

EXHIBIT 57

Average One-Year Letter Rating Migration



Source: Moody's, Data as of December 2020.

Overall, the aggregate credit losses across all ratings should converge to capital losses caused by defaults (with capital losses calculated based on purchase prices equal to bond issue prices). We highlight the fundamental difference between default losses and capital losses driven by spread fluctuations. Default losses are irreversible, whereas capital gains or losses due to changes in credit spreads can be offset by accrued differentials in future carry.

We have addressed the fact that, although the majority of actual defaults occur within bonds rated CCC and below, credit losses are spread across all ratings. The credit losses by investment grade bonds somewhat offset the default losses by high yield bonds in the form of lower starting prices as bonds are downgraded from investment grade into high yield. This refers to the phenomenon of "fallen angels": prices on bonds downgraded from BBB tend to reverse after short-term selling pressure has eased, resulting in attractive returns within BB14.

Our 10-year expected credit losses for corporate bonds are estimated as 50% of current option-adjusted spreads for both investment grade and high yield. This estimate is roughly in line with the long-term average figures from 1983 to 2020.

Risk Premium

(Expected Nominal Returns over Treasuries)

We believe that the historical excess returns bondholders have earned over Treasuries are attributable to several risk premia, notably covariance risk premium and illiquidity risk premium.

Covariance risk premium reflects both the risk premium associated with bondholders' uncertainty concerning future default losses and the risk premium associated with the high correlation between default losses and systematic equity market risk.

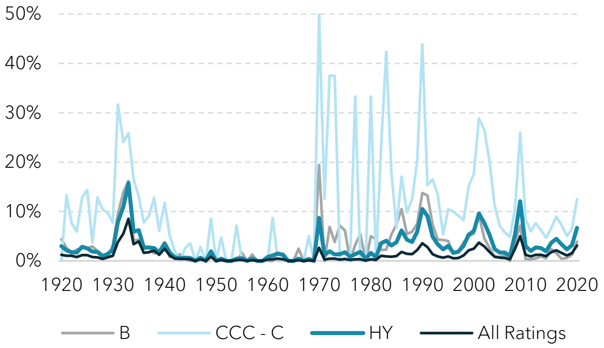
We focus our analysis of uncertainty in default rates among lower credit ratings (B and lower), where defaults are historically concentrated. Our findings show not only that historical default rates are highly volatile, but that there also appears to exist a "jump" component in the time series: defaults tend to occur at around the same time.

Such clustering effect further increases the challenge for bondholders to determine an accurate and sufficient level of yield required to compensate for future default losses. During periods of clustered defaults, bondholders are likely to suffer greater credit losses than the offsetting cushion embedded in initial credit spreads.

EXHIBIT 58

Default Rates are Volatile and Clustered

Global Corporate Default Rates 1920 – 2020



Source: Moody's, Data as of December 2020.

Furthermore, a 2010 study by Kay Giesecke and his co-authors finds little to no evidence that credit spreads forecast corporate default rates[15]. Although credit spreads offer sufficient compensation for realized credit losses over a long horizon, they are lagging indicators of credit losses and are unlikely to adjust quickly in response to fundamental factors resulting in changes in future default rates.

Default rates also tend to increase during economic downturns. Such cyclical effect makes bonds with high credit risk less favorable from bondholders' perspective. Because high-credit-risk bonds tend to perform worse during bad times, they offer little diversification benefit as most multi-asset investment portfolios generally carry significant exposure to systematic equity market risk.

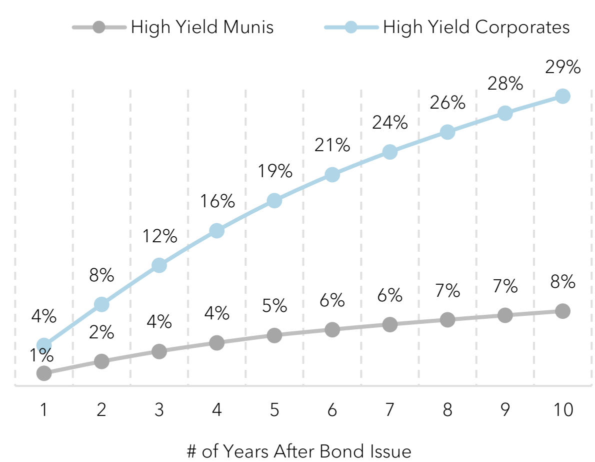
We believe that the illiquidity risk premium may be another driver of expected excess returns by credit instruments over the risk-free rate.

Although we have focused our discussion in this section primarily on US corporate bonds, we reference high yield municipal bonds as an example of illiquidity risk premium.

Relative to corporate bonds within the same credit ratings, municipal bonds have exhibited much lower credit riskiness, evidenced by historical default rates. Specifically, the average historical default rate of high yield municipal bonds over one year is 1% (versus 4% for high yield corporate bonds). Note that the default rate of all-rated municipal bonds over one year is 0.02% (versus 1.05% for all-rated corporate bonds). The median recovery rate for high yield municipal bonds is also significantly higher at 80% (versus 38% for high yield corporate bonds).

EXHIBIT 59

High Yield Muni Cumulative Default Rates

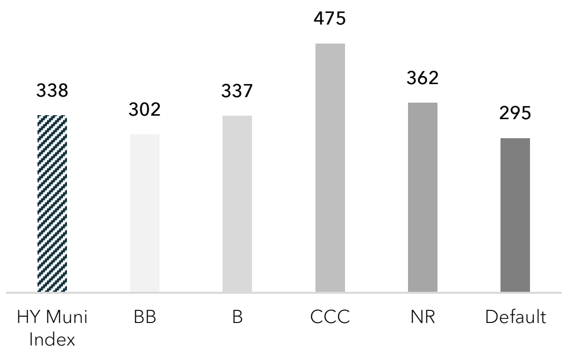


Source: Moody's. Data from 1970 to 2020.

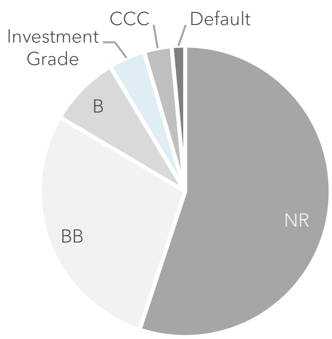
However, despite the lower default rates and the higher recovery rates, high yield municipal bonds offer comparable (if not more attractive) option-adjusted spreads versus the equivalent high yield corporate bonds. As of December 2020, the average OAS of high yield municipal bonds is 255bps of AAA muni (or 425bps on a tax-equivalent basis if we assume a marginal tax rate of 40%), whereas the average OAS of high yield US corporate bonds is approximately 405 bps over Treasuries.

EXHIBIT 60

High Yield Muni OAS over AAA Muni (bps)



Barclays High Yield Muni Index Weightings by Rating



Source: Bloomberg. Barclays Municipal High Yield Index. Data as of December 2020.

We believe that the illiquidity risk premium is the main driver of high yield municipal bonds' comparably more attractive ratio of credit spreads to expected credit loss.

Illiquidity risk premium is a function of several factors, most notably market capitalization.

The high yield muni market capitalization is currently just under $150 billion – a fraction of the US high yield corporate bond market, which in turn is a fraction of the US investment grade corporate bond market. Market capitalization is a dominant factor in determining the liquidity of the assets.

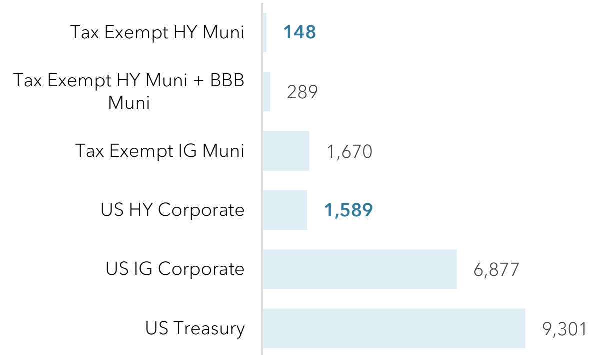
The targeted investor base of municipal bonds (taxable US retail investors in high income brackets) compared to that of corporate bonds (mostly institutional investors) further reduces liquidity for high yield municipal bonds.

Low liquidity is unattractive to bondholders and thus demands a corresponding risk premium as compensation. Illiquid assets are more expensive to trade in normal market environments. It also tends to be particularly costly to exit illiquid assets in a down market when the value of liquidity increases exponentially.

A "buy and hold" strategy may be more appropriate for such asset classes with attractive illiquidity risk premia. An actively managed strategy with frequent trading activities will most likely diminish the excess returns.

EXHIBIT 61

High Yield Muni Market Capitalization ($Billion)



Source: Bloomberg. Barclays US Treasury Index, Barclays US Aggregate Bond Index, Barclays Municipal Bonds Index, and Barclays Municipal High Yield Index. Data as of December 2020.

TABLE 4

US Fixed Income

Expected Strategic Nominal Return Breakdown (%)

	Initial Nominal Yield	Roll Yield	Expected Optionality & Credit Losses	Yield Curve Shift	Strategic Nominal Expected Return
Tax Exempt Municipal Bonds	**1.1**	**0.2**	**-0.2**	**0.5**	**1.6**
Tax Exempt Inv. Grade - Short Term	0.4	0.0	-0.0	1.6	2.0
Tax Exempt Inv. Grade - Intermediate Term	0.7	0.3	-0.1	0.8	1.8
Tax Exempt Inv. Grade - Long Term	1.5	0.2	-0.3	-0.2	1.3
Tax Exempt High Yield Muni	3.8	0.2	-0.6	-0.2	3.2
US Taxable Fixed Income	**1.1**	**0.4**	**-0.2**	**0.6**	**2.0**
US Taxable Inv. Grade - Short Term	0.3	0.0	-0.0	1.7	2.0
US Taxable Inv. Grade - Intermediate Term	1.1	0.6	-0.2	1.1	2.5
US Taxable Inv. Grade - Long Term	2.3	0.4	-0.4	-1.9	0.3
US Taxable High Yield Corporate	4.2	0.6	-1.8	1.1	4.1

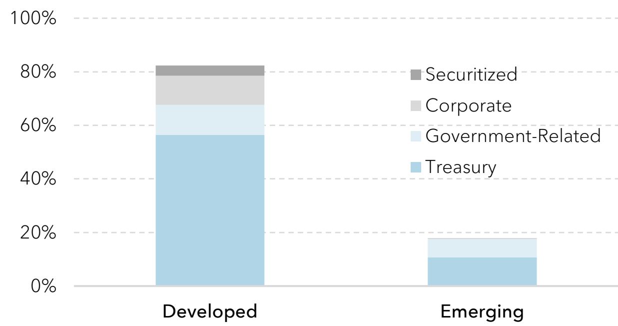
Developed International Fixed Income

We develop our long-term return forecasts for international fixed income based on the Bloomberg Barclays Global Aggregate ex-USD Index as the benchmark.

The index includes global investment grade debt from 24 local currency markets across the globe and covers an approximately equal number of countries of issuers from developed markets and from emerging markets. However, 82% of the index by market value is in sovereign and corporate bonds issued by the developed market countries. Additionally, sovereign, quasi-sovereign, and supranational debt account for 85% of total weight.

EXHIBIT 62

Global Aggregate ex-USD Index Composition



Index Weight %			
	Developed	Emerging	Total
Treasury	56	11	67
Government-Related	11	7	18
Corporate	11	0	11
Securitized	4	0	4
Total	82	18	100

Nominal Yield %			
	Developed	Emerging	Total
Treasury	0	278	108
Government-Related	25	167	45
Corporate	70	97	71
Securitized	-22	-15	-22
Total	40	214	57

Source: Bloomberg. MSCI Global Aggregate ex-USD Index; Data as of December 2020.

The current nominal yields of international fixed income assets are the lowest among the fixed income asset classes discussed in this paper, due to the current low-to-negative rates in many developed international regions.

The current average years to maturity and duration of the Global Agg ex-USD index are 9 years and 7.5 years, respectively. We have established that initial nominal yield is an effective predictor of future returns, particularly for high-quality bonds whose maturities/durations are aligned with the forecast horizon.

The combination of low initial nominal yield of the index along with the relatively flat government yield curves across the top countries by index weight suggests modest 10-year expected returns for international fixed income.

EXHIBIT 63

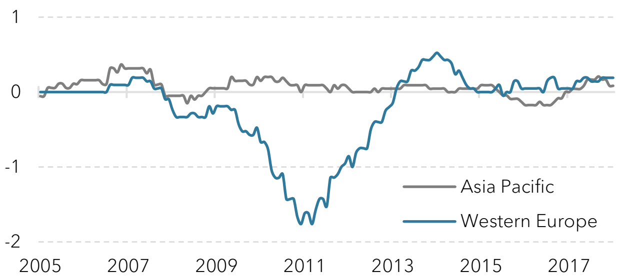
2-Year/10-Year Yield Spread (bps)

Source: Bloomberg. Data as of December 2020.

Our expected return methodology for international fixed income is similar to our methodology for US credit, with a smaller adjustment for expected credit losses. The historical one-year default rate for investment-grade-rated sovereign bonds is 0% according to research by Moody's (2020)[16]. Rating drifts of sovereign issuers in Asia Pacific and Western Europe have also been moderate, except for one large correction in 2011 resulting from the European sovereign debt crisis and the Greece default.

EXHIBIT 64

Rating Drifts of Sovereign Issuers



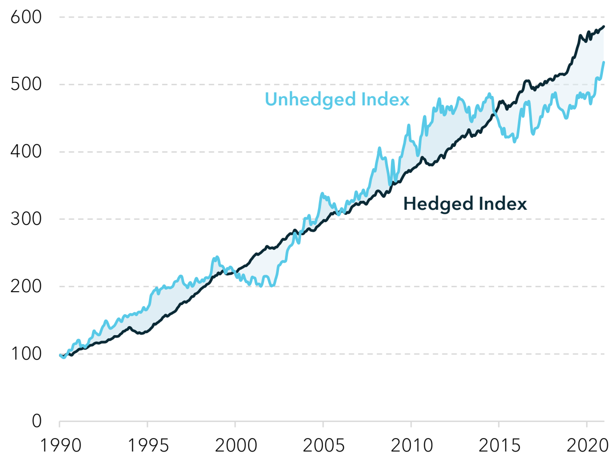
Source: Moody's. Data from 2005 to 2019.

Importantly, we recommend that US investors consider currency hedging when investing in international fixed income. While we have intentionally stayed away from forecasting future returns of currencies, we expect movements in foreign exchange rates to be the dominant contributor to variance in future returns from the perspective of US investors. Historically, the local returns of international fixed income have exhibited consistently low volatility over the past three decades. Note that our return estimates do not take into account the gains and losses associated with currency hedging; however, we expect US investors to earn additional positive returns from currency hedging due to the current interest-rate differentials between the US and developed international countries.[i]

EXHIBIT 65

Currency Hedge Improves Risk Adjusted Returns

	Annualized Return %	Annualized Volatility %
Global Agg ex-USD Hedged	6.0	2.8
Global Agg ex-USD Unhedged	5.6	8.2



Source: Bloomberg. MSCI Global Aggregate ex-USD Indices. Data from January 1990 to December 2020

[i] Our return forecasts for developed international fixed income correspond to the MSCI Global Aggregate ex-USD hedged Index.

Emerging Markets Fixed Income

Emerging markets debt as an asset class has evolved since 1989, when "Brady bonds" were first introduced by former U.S. Treasury Secretary Nicholas Brady in an effort to restructure the nonperforming debt issued by Latin American countries as securitized bonds into tradeable US-dollar-denominated securities.

Over the last three decades, the investable universe of emerging markets debt has developed into three main branches: (1) hard currency debt issued by sovereign governments, (2) local currency debt issued by sovereign governments, and (3) debt (primarily in hard currency) issued by emerging market corporations.

In this paper we focus on the first two sub-asset classes: hard and local currency sovereign debt issued by emerging market countries.

Some US investors have maintained the perception that the principal difference between hard currency sovereign debt (commonly represented by the JPMorgan EMBI-GD Index) and local currency sovereign debt (commonly represented by the JPMorgan GBI-EM Index) may be primarily viewed as a choice between taking on emerging markets credit risk versus emerging markets currency risk. Such perceived tradeoff, however, does not strictly hold. One explanation is the different compositions of the two indices. Another less straightforward consideration is that, while sovereign lenders can theoretically print as much money as needed in order to satisfy their local currency debt obligation, historically there have been instances where local currency debt defaults occurred because of the issuers' lack of willingness to pay, for regulatory and political reasons (GMO 2017)[17]. Thus, the credit risk on local-currency sovereign debt is not completely eliminated.

Our expected return methodology for hard-currency EM sovereign debt is similar to our methodology for US credit, with a smaller adjustment for expected credit losses.

We apply an additional adjustment to expected returns for local currency EM sovereign debt to account for the inflation differential between the US and the local emerging market countries.

Hard Currency EM Sovereign Debt

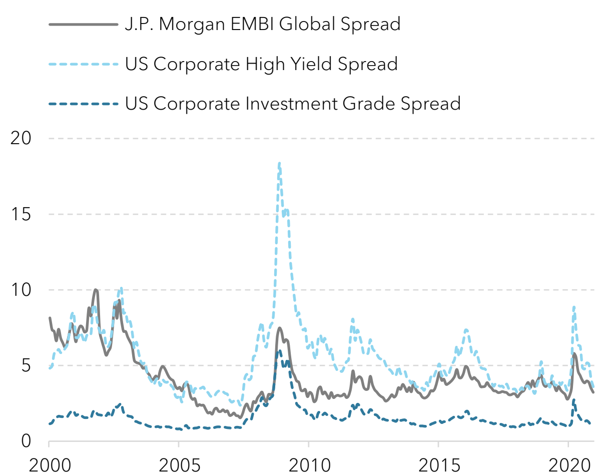
Hard currency emerging markets debt (represented by the JPM EMBI-GD index) consist of 85% government-guaranteed issues and 15% quasi-sovereign issues that are government-owned but not explicitly guaranteed.

From the perspective of US investors, hard currency EM sovereign debt denominated in US dollar should carry no currency risk. The principal drivers behind the returns of hard currency EM sovereign debt, therefore, are somewhat comparable to those associated with US corporate credit.

Between 2000 and 2007, EMBI-GD spreads and US high yield spreads moved closely together. During the global financial crisis throughout 2008 and 2009, EMBI-GD spreads reached similar levels as US investment grade spreads while US high yield spreads spiked. Since then, EMBI-GD spreads have remained between US investment grade and high yield spreads, and most recently converged towards US high yield spreads. The range in which EMBI-GD spreads fluctuate partly reflects the credit-rating composition of hard currency EM sovereign debt. As of December 2020, roughly 55% of the EMBI-GD index constituents are investment grade rated.

Exhibit 66

Option-Adjusted Spread to US Treasury (%)

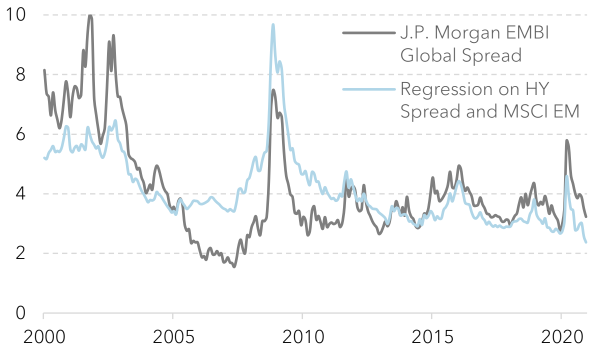


Source: Bloomberg. Data from January 2000 to December 2020.

We find that changes in EMBI-GD spreads can be partially explained using a linear function of US Corporate High Yield spreads and the MSCI Emerging Markets Equity Index. (Including US 10-Year Treasury Yield and the VIX in the model marginally improves the percentage of variation explained; however, the effect of collinearity dominates and muddles the economic explanation of the model outputs.)

EXHIBIT 67

EMBI-GD Spreads explained by US High Yield Credit Spreads & MSCI EM Equity Returns



	US Corporate High Yield Spreads	MSCI EM Equity Index (Natural Log)	Combined
R^2	0.39	0.64	0.78

Source: Bloomberg. Data from January 2000 to December 2020.

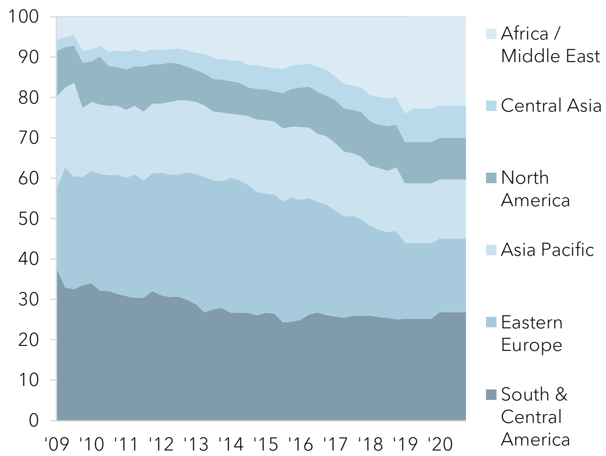
Individually, EMBI-GD spreads correlate positively with US corporate high yield spreads, reflecting both asset classes' sensitivity to global risk sentiment. Separately, EMBI-GD spreads correlate negatively with the MSCI Emerging Markets Equity Index. This is fairly intuitive: the risk premium demanded by investors to hold emerging market sovereign debt tends to decrease with improved prospects for the underlying strength of the issuers. When controlling for the MSCI EM Index, however, EMBI-GD spreads move in the opposite direction of the US corporate high yield spreads. For investors looking for yield in the context of a multi-asset portfolio, we emphasize that there is diversification benefit to be gained by being exposed to both US corporate credit and EM sovereign credit, so as long as the aggregate beta exposure to EM equities is acknowledged and accounted for in asset allocation decisions.

The tightening of the credit spreads and the comparably lower volatility than that of EM equities have collectively contributed to hard currency EM sovereign debt being one of the best-performing asset classes over the last two decades on a risk-adjusted basis.

In addition to the continued advance of emerging markets, another explanation for hard currency EM sovereign debt' recent past performance is the change in the composition of the EMBI-GD index.

EXHIBIT 68

EMBI-GD Composition by Region (%)



Composition Weighting % Change from 2009 to 2020

	Absolute Difference in Index Weight	Percentage Difference in Index Weight
Africa / Middle East	+17%	+307%
Central Asia	+5%	+179%
North America	-1%	-9%
Asia Pacific	-8%	-36%
Eastern Europe	-1%	-7%
South & Central America	-11%	-28%

Source: Bloomberg. JPMorgan Index; Data from January 2009 to December 2020.

Only ten years ago, Latin America accounted for nearly 40% of the index weight. Today, the weights are allocated more evenly across regions around the world.

Furthermore, large index constituents such as Indonesia, Russia, and the Philippines have seen significant spread compression since the early 2000s. The inclusion of China, which has one of the largest dollar reserves among emerging and developed countries, further brings down the overall credit riskiness of the EMBI-GD index. This has profound implications going forward as China gains greater and greater weighting within the index.

On the other hand, the systematic process whereby advancing frontier-market countries are introduced into the index and maturing emerging market countries are upgraded out of the index suggests that the historical trend of tightening credit spreads is unlikely to be stationary. As the underlying exposure associated with owning EM dollar bonds continuously evolves, it is critical that investors be aware of the specific country exposure acquired through their investment implementation – whether passive or active – when allocating to hard currency emerging market sovereign debt.

Local Currency EM Sovereign Debt

Compared to hard currency EM sovereign debt, the local currency EM sovereign debt investment universe (represented by the GBI-EM index) consists of fewer countries with a smaller allocation to frontier markets.

This results in a slightly higher overall credit rating of GBI-EM compared to that of EMBI-GD. The corresponding downside of capturing fewer, more "developed" sovereign issuers is the increased concentration to individual countries. For example, the largest issuer in the JPM EBI-EM 15% Cap 4.5% Floor Index is China, which has a weight of just under 15%, whereas the highest single-country weight in the EMBI-GD index is around 5%. The composition of GBI-EM index may deviate quite substantially from the actual universe of local currency EM sovereign debt. For example, local currency sovereign bonds issued by India are currently excluded from the GBI-EM Index due to a lack of readily available accessibility to foreign investors. The total size of the local currency EM sovereign debt market is several times greater than that of hard currency EM sovereign debt.

Additionally, it is worth noting that the GBI-EM index has a modified option-adjusted duration of 5.4 years, whereas the EMBI-GD index has a modified option-adjusted duration of 8.5 years.

We find that, based on data from 2008 and 2020, hard currency EM sovereign debt have a higher correlation with US Corporate High Yield, whereas local currency EM sovereign debt have a higher correlation with EM Equities. This validates our prior discussion on the principal risk tradeoff between hard currency versus local currency EM sovereign debt. Besides sensitivity to changes in interest rates (which affects most fixed income instruments), the primary risk associated with hard currency EM debt is credit risk, while the primary risk associated with local currency sovereign debt is currency risk, which can be captured in the form of high correlation with EM Equities. The higher standard deviation associated with local currency EM sovereign debt is likely also attributed to the currency effect.

EXHIBIT 69

Correlation with EM Equities and US High Yield

	Correlation				Volatility
	EMBI-GD	GBI-EM	MSCI EM	US HY	
EM Dollar Bonds (EMBI-GD)	1	0.81	**0.73**	**0.79**	**9.3%**
EM Local Bonds (GBI-EM)		1	**0.82**	**0.67**	**12.6%**
EM Equity (MSCI EMTR)			1	0.79	22.0%
US Corporate High Yield				1	10.3%

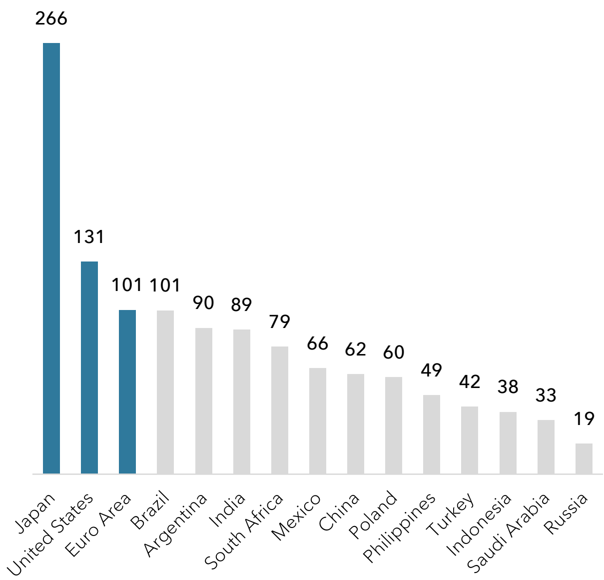
Source: Bloomberg. Data from January 2008 to December 2020.

EM Fixed Income Expected Return Methodology

Against the backdrop of increasing concern about corporate balance-sheet leverage in the US, fundamentals throughout many emerging market countries appear well supported. While the ratios of government debt to GDP in developed economies such as the US, the Euro-zone, and Japan have grown significantly since the global financial crisis to approach or exceed 100%, emerging market countries overall appear to be better positioned fiscally, with substantially lower sovereign debt levels.

EXHIBIT 70

Gross Government Debt to GDP Ratio (%)

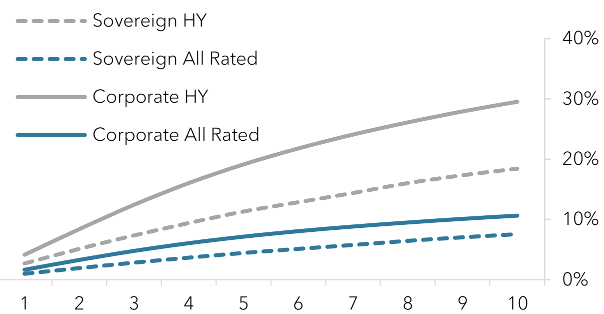


Source: IMF. Date as of December 2020.

The average default loss for sovereign debt tends to be less severe than for corporate bonds. While research by Moody's indicates that corporate bonds and sovereign bonds have somewhat similar average recovery rates at around 40%, sovereign bonds have generally lower default rates than corporate bonds across both investment grade and high yield.

EXHIBIT 71

Default Rates of Sovereign vs. Corporates



	Default Rate % in One Year	
	Sovereign	Corporate
Investment Grade	0.0	0.1
High Yield	2.7	4.1
All Rated	1.0	1.6

Source: Moody's. Data from 1983 to 2020.

As discussed previously, the raw spreads over risk-free assets (US Treasuries) can be decomposed into ex ante return advantage (risk premium) and expected impact from credit losses and optionality. We believe that the illiquidity risk premium is a main driver of ex ante return advantage of emerging markets sovereign debt over US Treasuries. The average bid-ask spread on emerging market sovereign debt in a normal market environment is between 50 and 80 bps – significantly greater than rating-equivalent US corporate bonds.

Our long-term credit losses for hard currency sovereign debt is estimated as 20% of current option-adjusted spreads for both investment grade and high yield, lower than the 50% haircut applied to corporate bonds.

Lastly, we apply an additional adjustment to local-currency sovereign debt in order to maintain comparable real yields across hard currency and local currency bonds with the same issuer countries. The adjustment reflects the inflation differential between the US and emerging market countries within the GBI-EM Index.

Ultra-Short Fixed Income

Estimating the expected return for ultra-short fixed income (we use 3-month T-Bills as the benchmark) over a long time horizon is one of the more challenging exercises discussed in this paper. The difficulty stems from the time-varying nature of short-term rates and the resulting substantial estimation uncertainty. Given that the expected returns of long-term US Treasuries are fairly transparent and largely determined by their current nominal yields, we believe that the expected return of 3-month US T-bills is ultimately driven by the forward-term premium.

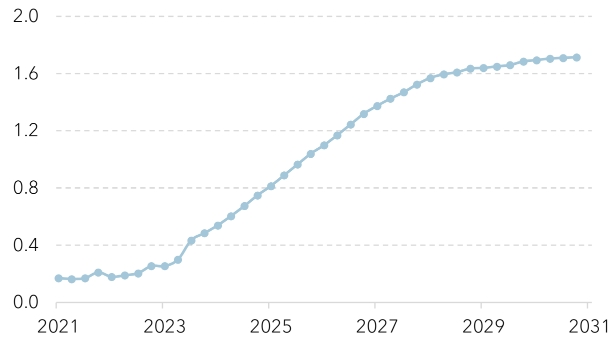
Term premium is the difference between the yield on a long-term bond (say 10-year maturity) and the expected average path of short-term rates over the 10-year period. The magnitude of term premium is determined by several factors, including supply and demand as well as risk premia associated with uncertainty in future inflation and real rates, among other factors. Before the global financial crisis, term premium was generally positive, implying a positive risk premium demanded by investors in order to own longer-term bonds. After the crisis, the supply-and- demand factor became dominant as a result of the Fed's quantitative easing programs and the large-scale purchases of long-maturity bonds. Amid the low-yield environment around the global market, institutional investors such as insurance companies and pension funds have also become increasingly larger buyers of long-maturity US Treasuries based on their mandates to match assets and liabilities.

Our strategic return forecast for ultra-short fixed income is based on 10-year Treasury yields minus an estimated term premium.

By no-arbitrage condition, we first construct the nominal yield on a zero-coupon US Treasury bond based on the return locked in today using a sequence of consecutive 3-month Eurodollar futures over the next 10 years. We then borrow the estimated value of 10-year term premium from the Kim-Wright model. We choose the Kim-Wright method because it combines a quantitative forecasting model with surveys of professional forecasters' short-rate expectations (Li, Meldrum and Rodriguez 2017)[18]. Given the backward-looking nature of most dynamic-term structure models and the high persistence of Treasury yields over the past decade, we believe that the incorporation of qualitative surveys serves as an important anchor for forecasting rational future term premia.

EXHIBIT 72

3 Month Eurodollar Futures



Source: Bloomberg. Data as of December 2020.

EXHIBIT 73

Kim-Wright Forward 10-Year Term Premium

Source: The Federal Reserve. Data as of December 2020.

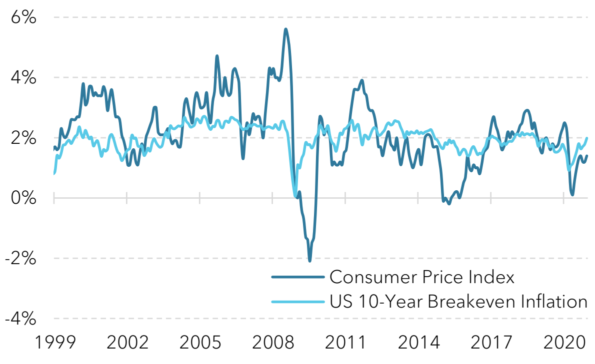
US Treasury Inflation-Protected Securities (TIPS)

The principal difference between traditional US Treasuries and Treasury Inflation-Protected Securities (TIPS) is that the latter offer investors a hedge against any unexpected rise in inflation during the life of the bonds. Specifically, the principal and interest payments of TIPS are linked to the Consumer Price Index (CPI), which measures the inflation rate in the US. As a result, the nominal yield of TIPS can be decomposed into the real yield and the current inflation rate reflected by the CPI.

As a hypothetical example, an investor who purchases a 10-year US Treasury bond with a nominal yield of 2.5% may expect an average annualized future return of approximately 2.5% over the life of the bond. Separately, an investor that purchases a 10-year TIPS at par with a 0.5% coupon may expect an average annualized future return of approximately 0.5%, which represents the real yield component of the TIPS. Additionally, because the principal and interest payments of the TIPS are adjusted on an ongoing basis with the CPI, the investor may expect an additional return each year equivalent to the observed inflation rate. If inflation remains constant at 2% throughout the life of the bond, the total annualized return earned by the investor at maturity would be roughly 2.5%, the sum of real yield and the observed inflation rate. However, if inflation unexpectedly rises to 3%, the investor should expect to earn 3.5% in total, or 1% more. The difference between the nominal yield of a traditional US Treasury bond and the real yield of an equivalent TIPS bond is called the breakeven inflation rate. In our hypothetical example, the breakeven inflation rate is 2.0%.

Exhibit 74

Historical CPI Inflation vs. Forward Expectation



Source: Bloomberg. Data from 2000 to 2020.

Because the CPI index tracks the prices of goods and services in the US, investing in TIPS helps investors maintain the future purchasing power of their capital by providing a hedge against any unexpected rise in inflation. On the other hand, should inflation decline below the breakeven inflation rate, an investor in TIPS should expect to receive correspondingly lower coupon payments. The principal, however, is generally floored at par.

This asymmetry of potential upside and downside in return versus potential changes in inflation implies that there may exist a positive inflation risk premium that is embedded in the perceived breakeven inflation rate. Research conducted by the Fed in 2012 found that the inflation risk premium was negative during periods of high illiquidity of TIPS and deflation scare, and significantly positive during periods of high inflation.

The volatility of the inflation risk premium is also found to correlate with the volatility of inflation expectations. Given the current environment, where inflation expectations are well anchored by the Fed's monetary policies, we expect the magnitude of any potential inflation risk premium to be relatively consistent and potentially somewhat minimal going forward. As a result, we do not deconstruct the breakeven inflation rate perceived by the market into inflation risk premium and what may be the "true inflation expectation."

For high-quality, long-term bonds, we have found strong predictability of future long-term real yield through looking at current real yield. We estimate the expected 10-year average nominal return of US TIPS to be the sum of current real yield, roll yield (based on the current Treasury real yield curve) and current 10-year US breakeven inflation rate.

ALTERNATIVE INVESTMENTS

We consider three broad asset classes within alternative investments: (1) commodities, (2) hedge funds, and (3) private investments.

2021 Expected Long-Term Nominal Returns for Alternative Investments[i] (%)

TABLE 5

	Strategic	*Secular*	*Historical*		
	(10-Year)	*(Equilibrium)*	Past 20 Years	Past 15 Years	Past 10 Years
Commodities					
Commodities ex-Precious Metals	-0.5	0.7	-0.9	-5.9	-8.1
Precious Metals	4.2	5.4	9.1	7.8	0.8
Hedge Funds					
Global Macro	5.8	7.0	7.3	6.0	4.3
Managed Futures	2.9	4.0	4.5	3.4	0.6
Fixed Income Relative Value	4.4	5.5	5.9	4.8	4.9
Equity Market Neutral	4.1	5.1	3.8	3.2	3.2
Structured Credit	4.5	5.6	6.8	6.2	5.9
Distressed / Restructuring	4.7	5.8	7.5	5.8	4.4
Risk Arbitrage	3.9	4.7	4.7	4.8	4.1
Equity Long/Short (Long Biased)	6.3	6.6	6.5	5.8	5.7
Activist	7.6	7.2	7.7	5.2	6.4
Private Investments					
Private Equity & Direct Investments	12.2	10.2	12.6	13.0	13.6
Private Debt	7.6	8.9	9.0	9.1	9.2
Private Real Estate	9.1	7.8	8.2	5.6	9.2

[i] Annualized returns (geometric averages).

COMMODITIES

In portfolio management, commodities have a long track record of serving a variety of functions such as inflation hedges and speculative plays. Based on their correlations with macro factors, we further categorize commodities into two asset classes: (1) commodities ex precious metals and (2) precious metals. The former includes energy commodities (e.g., crude oil and natural gas), industrial metals (e.g., copper and aluminum), and agricultural goods (e.g., soybean and live cattle); the latter includes gold and silver. Precious metals account for roughly 20% of the weighting within the Bloomberg Commodity Index.

While investments in commodities take a variety of forms, in this paper we estimate prospective returns for commodities under the assumption that we gain exposures by investing in commodity indices[19], which are constructed with sequential futures contracts[i]. Our estimated prospective returns thus consist of three components: (1) spot price returns, (2) futures roll yields, and (3) interest returns on collateral posted against futures contracts.

Commodities are often perceived as an effective hedge against inflation, as their prices tend to rise when inflation accelerates. To gain exposure to the spot prices of commodities, however, one needs to actually own the physical assets. For most investors, it is not realistic to physically hold meaningful amounts of commodities over a substantial period of time because they are generally perishable and/or costly to store – think soybeans or pork bellies – with perhaps gold bars as one of the few exceptions.

To gain exposure to commodity prices, the common approach is to buy commodity futures, which have expiration dates and thus require continuous rolling. Historically, the commodity futures markets have typically been in contango[ii]. (Note that the crude oil futures markets did experience a sustained period of backwardation during the 1970s largely due to severe supply shocks.)

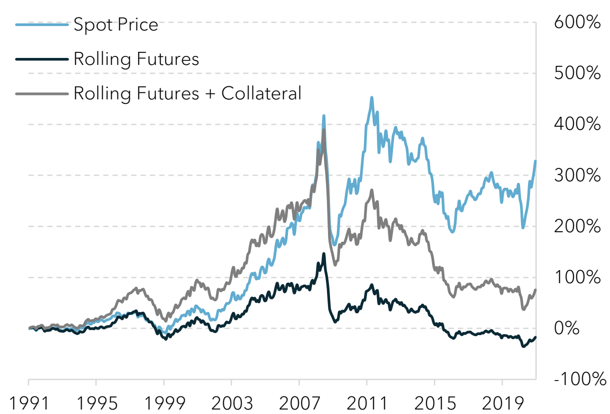
Contango term structures are directly associated with negative roll yields, which result in the actual returns experienced by investors being meaningfully lower than the returns implied by the spot prices.

In fact, while the spot prices of commodities appreciated on average by 5.0% annually from 1991 to 2020, the corresponding futures over the same period delivered a rather disappointing annualized return of -0.6%, implying a negative roll yield of 5.6%.

Exhibit 75

Bloomberg Commodity Index Cumulative Returns

1991 – 2020



	Cumulative	Annualized		
Spot Price	328%	5.0%		
Rolling Futures Returns	-17%	-0.6%	**-5.6%**	**Roll Yield**
Rolling Futures + Collateral Returns	76%	1.9%	**+2.5%**	**Returns on Collateral[iii]**

Source: Bloomberg. Barclays Commodity Indices. Data from January 1991 to December 2020.

Although commodities are commonly associated with pronounced positive sensitivities to rising inflation, the sizable negative roll yields prompts the question of whether commodities, when accessed via futures contracts, are indeed an effective hedge against inflation risk. In comparison, assets such as TIPS, real estate, and equities also offer the potential utility of inflation hedge in a multi-asset portfolio without the disadvantage associated with negative roll yields. With that said,

[i] Investing in commodity indices – versus investing in real assets (which has its own limitations) – has proved disappointing at times when anticipated diversification protection and returns failed to materialize (Harvard University 2011)[19].
[ii] Contango refers to a market scenario where the futures prices of a commodity are higher than the current spot price.
[iii] Collateral returns represent the returns on cash collateral (against futures contracts) invested in 3-month US Treasury Bills.

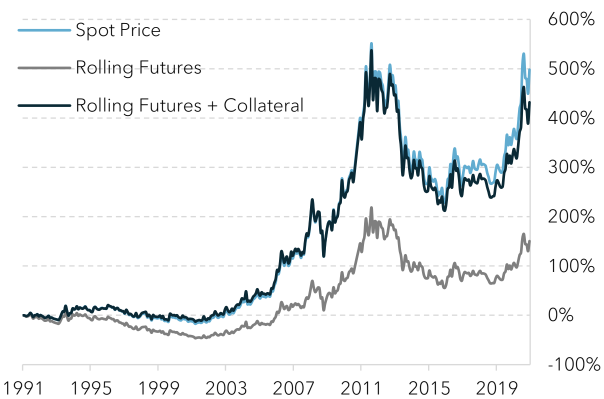
inflation is one of multiple macro drivers that influence the spot and futures prices of commodities. Investors should assess the relative attractiveness of commodities holistically, by taking into account commodities' sensitivities to factors such as growth expectations, real rates, and volatility, as well as viable implementation options.

It is worth nothing, however, that the contango or negative roll yield effects are relatively less pronounced for previous metals, e.g., gold. If we take into account the additional returns of interest rates earned on the collateral (typically short-term T-bills), the combined total returns over the past two decades nearly match the total turns of spot prices.

EXHIBIT 76

Bloomberg Precious Metals Index Cumulative Returns

1991-2020



	Cumulative	Annualized		
Spot Price	498%	6.0%		
Rolling Futures Returns	151%	3.1%	**-3.0%**	**Roll Yield**
Rolling Futures + Collateral Returns	432%	5.7%	**+2.6%**	**Returns on Collateral**[i]

Source: Bloomberg. Barclays Commodity Indices. Data from January 1991 to December 2020.

Precious metals, notably gold (effectively removing silver, which is more strongly associated with industrial applications), also tend to rally in a rising inflation environment. It is worth noting that although commodities as a whole tend to correlate positively with inflation, the underlying constituents, in particular gold versus the others, have opposing correlations with growth expectations.

In generally, due to the combination of poor historical long-term returns (partly due to negative roll yields) and high volatility, we typically do not recommend a strategic allocation to commodities. We see greater potential in this asset class when it is implemented on a more selective, opportunistic basis. With that said, given our medium term expectation of potentially higher inflation and rising long-term real rates, we see a stronger case for incorporating gold as a strategic asset class in such macro environment. A calibrated blend of gold and long-term US Treasuries may present an effective hedge against potential growth disappointments while maintaining muted sensitivities to inflation risk.

Our long-term return forecasts for commodities (spot price returns plus roll yield) are directly derived from historical long-term averages. Separately, we align the expected interest returns on the collateral posted against commodity futures with our return estimates for ultra-short fixed income (i.e., benchmark 3-month US Treasury bills).

[i] Collateral returns represent the returns on cash collateral (against futures contracts) invested in 3-month US Treasury Bills.

HEDGE FUNDS

The hedge fund universe is broad and heterogeneous, comprised of predominantly private vehicles managed with diverse investment styles. In this paper, we focus on nine major hedge fund strategies with distinct combinations of sources of returns and betas to systematic market factors. The nine strategies are (1) global macro, (2) managed futures, (3) fixed income relative value, (4) equity market neutral, (5) structured credit, (6) distressed/ restructuring, (7) risk arbitrage, (8) equity long/short (long biased), and (9) activist. To develop our long-term expected returns for the above hedge fund strategies, we deconstruct historical excess returns over risk-free-rate of respective hedge fund indices, identify the return component attributable to traditional risk premia (e.g., equity risk premium, credit risk premium), and incorporate our estimated returns for public equity and fixed income asset classes. Our strategic and secular outlook for the residual return component is based on historical long-term average, with greater weights assigned to recent history.

Note on hedge fund index biases and drawbacks:

We estimate the expected long-term returns for the nine major hedge fund strategies listed in the following using primarily Hedge Fund Research HFRI indices and Credit Suisse Hedge Fund indices, which are designed to track the performance of the respective hedge fund strategy, net of performance fees and expenses. Such approach, however, presents challenges that do not apply to analyzing traditional stocks and bonds by using equity and fixed income indices. We identify three main drawbacks associated with analyzing raw hedge fund index data: (1) survivorship bias, (2) selection bias, and (3) illiquidity bias (Fung and Hsieh 2001)[20].

Survivorship bias arises when hedge funds are removed from indices when they are liquidated (presumably due to poor performance), which results in an upward skew in index performance[21].

Selection bias primarily refers to the voluntary nature of fund performance reporting. Because hedge funds with poor performance are generally less inclined to make their information available, such voluntary inclusion likely results in a positive skew in index performance. On the other hand, at times, hedge funds with good performance may also elect to stop reporting returns due to their preference for privacy coupled with a lack of need for capital raising. In this second scenario, the voluntary exclusion may result in a negative skew in index performance.

Illiquidity Bias refers to the smoothing effect on reported returns, as some hedge funds hold illiquid assets with no readily available fair values for marking to market. Such smoothing effect deflates the volatility of hedge fund index performance versus the underlying economic exposure.

To minimize the effect of survivorship bias in hedge fund index data, we apply an absolute downward adjustment to our estimated returns[i] (the methodology of estimating such returns are discussed more in-depth in the following section).

The effective of selection bias is challenging to measure accurately, as the complete hedge fund universe is not observable. In their 2000 study, William Fung and David Hsieh[21] argue that the magnitude of selection bias in hedge fund index data may be limited due to the existence of both positive and negative skews.

For certain hedge fund strategies that involve holding somewhat illiquid assets (i.e., fixed income relative value, structured credit, and distressed/restructuring), the smoothing effect may be corrected using quantitative methods[22]. We confirm that the hedge fund index return series for fixed income relative value, structured credit, and distressed/restructuring strategies present evidence of serial correlation of order 1[ii]. By applying the method developed by David Geltner (1993) for AR(1) model, we are able to obtain unsmoothed return series[23].

The standard deviations of the unsmoothed returns increase by 49%, 51% and 53% (compared to the standard deviations of the reported index returns) for fixed income relative value, structured credit and distressed/restructuring strategies, respectively.

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[i] In their 2000 analysis, William Fung and David Hsieh estimate the survivorship bias in hedge funds at roughly 3% a year. The HFRI Fund Weighted Composite index returned 18% per year from 1990 to 2000, and 6% per year from 2000 to 2020. To maintain a somewhat consistent proportion of survivorship bias to average total returns, we assume the magnitude of survivorship bias in recent history to be 1%.

[ii] A time series where the value at some point t in time is closely correlated with the preceding value one period earlier at t-1.

Exhibit 77

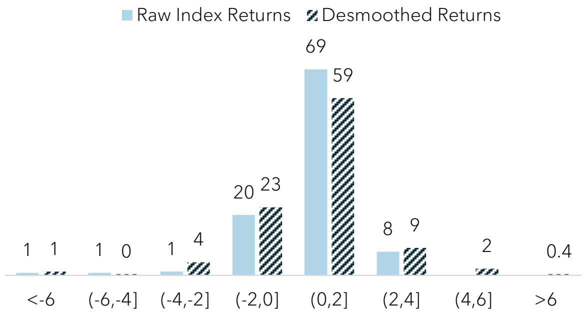
	Annualized Standard Deviation %		Increase in "True" Risk
	Raw Index	Unsmoothed	
Fixed Income Relative Value	5.2	7.7	49%
Structured Credit	5.7	8.0	41%
Distressed / Restructuring	6.4	9.7	53%

Source: Bloomberg. HFRI Indices and Credit Suisse Hedge Fund Indices. Data from 2002 to 2020.

Exhibit 78

Fixed Income Relative Value

Distribution of Monthly Returns (%)

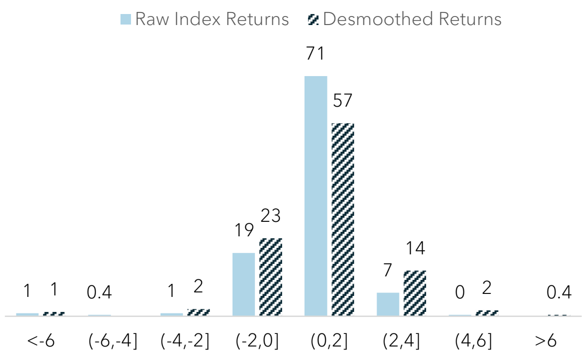


Source: Bloomberg. HFRI Fixed Income Relative Value Indices. Data from 2002 to 2020.

Exhibit 79

Structured Credit

Distribution of Monthly Returns (%)

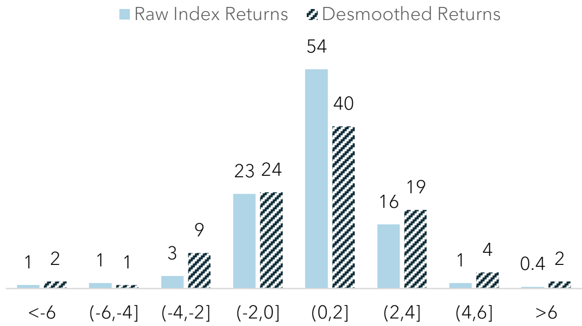


Source: Bloomberg. Credit Suisse Structured Credit Index.

Exhibit 80

Distressed / Restructuring

Distribution of Monthly Returns (%)



Source: Bloomberg. Credit Suisse Distressed Index.

Another potential drawback of hedge fund index data is the "unintentional diversification effect." While investors in stocks and bonds generally hold a minimum number of positions (e.g., 30 unique names) to maintain sufficient diversification and to achieve a similar level of portfolio volatility as that of the corresponding index, investors rarely hold 30 hedge funds of similar strategies. Therefore, the volatility implied by a hedge fund index likely understates the median volatility of individual hedge funds within the index.

On the other hand, Fund and Hsieh (2001) find that broad-based hedge fund indices display stronger correlations with traditional equities and fixed income than individual hedge fund constituents do. While the returns of individual hedge funds contain a large component of idiosyncratic risk, such nonsystematic risk is diversified away in a broad-based hedge fund index, leaving systematic risk as the dominant risk.

In short, a hedge fund index – as a proxy for a single hedge fund – has the tendency to understate the volatility (an undesirable attribute) as well as the diversification potential (a desirable attribute) of the fund. As we assess the incremental contribution to risk by a single hedge fund within a multi-asset portfolio, it is difficult to judge the net impact associated with using a hedge fund index as a proxy for a single hedge fund. With the exception of the equity market neutral strategy, we do not correct for the "unintentional diversification effect" by applying upward volatility adjustments to our listed hedge fund strategies.

On an index basis, the equity market neutral strategy displays positive but rather weak correlations with traditional public equity indices. This observation removes the basis of our "zero net impact" argument discussed above. According to research by Daniel Scansaroli (2016), the HFRI Relative Value index understates volatility by roughly 2% compared to the median volatility of the underlying hedge fund constituents[24]. Because the HFRI Relative Value index consists of hedge funds that employ relative value strategies across not only equities but also fixed income, commodities, currencies, etc., we believe that the volatility understatement effect is likely smaller for an index that represents solely the equity market neutral strategy, as such index captures a relatively more homogenous universe. Given all the considerations stated above, we apply an absolute volatility increase of 2% to the equity market neutral strategy.

Hedge Fund Expected Return Methodology

We begin our estimate of prospective hedge fund returns (net of performance and expense fees) by first separating total returns into cash yields and excess returns over cash.

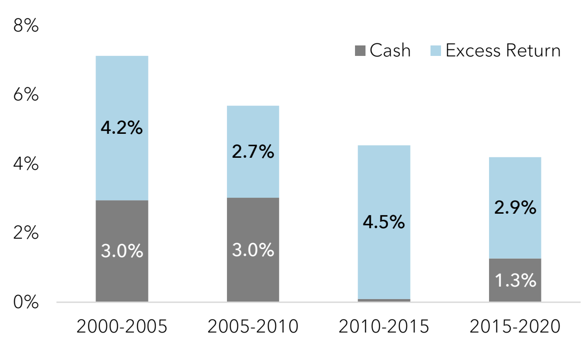
Hedge fund performance is generally evaluated on an excess-of-cash basis. Excess return – compared to total return – is a more meaningful measurement of performance against the amount of risk taken by hedge fund managers. For hedge funds that employ leverage and aim for "absolute return," cash is arguably the appropriate benchmark. A high-level comparison of historical hedge fund returns across interest rate regimes indicates that cash yields have mattered for hedge fund total returns.

Note that the comparison illustrated is meant to be directionally indicative, and as the HFRI Fund Weighted index includes both market neutral strategies and directional strategies, the total returns of the latter are presumably less directly linked to cash yields. We estimate expected annual cash yields based on our return forecasts for ultra-short fixed income.

EXHIBIT 81

Hedge Fund Total Returns and Cash Yields

Annualized Total Returns Net of Fees



Source: Bloomberg. HFRI Fund Weighted Index. Data from January 2000 to December 2020.

We believe that it is safe to state that there is now a general consensus that hedge funds excess returns are not purely alpha. In fact, some critics have claimed that, on a net-of-fee basis, hedge funds may not have delivered any alpha to investors at all over the recent years. Given the heterogenous nature of the hedge fund population, we believe that top-quartile funds do deliver alpha. Nevertheless, the magnitude of such alpha is difficult to forecast with any level of accuracy.

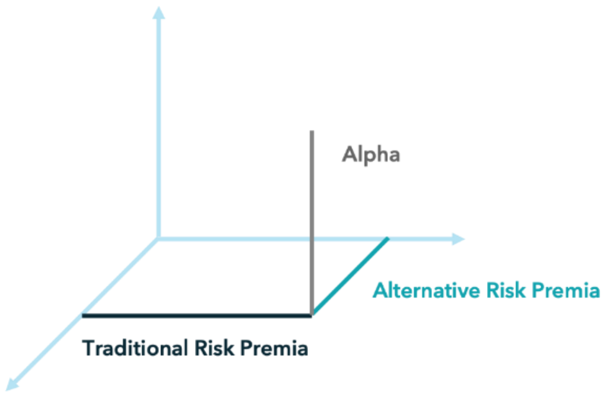
To develop our strategic outlook for hedge fund returns, we decompose the expected excess returns into three components: (1) traditional risk premia, (2) alternative risk premia, and (3) true alpha.

Traditional risk premia are returns that investors expect to earn for having exposure to traditional long-only markets (e.g., stocks and bonds). For example, a hedge fund that maintains a consistent and significant positive beta to the S&P 500 tends to outperform its market-neutral peers when the equity index rallies. Such expected outperformance represents the potential reward associated with taking on traditional equity market risk – equivalent to investing directly in the S&P 500 stocks – and should not be attributed to the skills of the hedge-fund manager.

As traditional risk premia have become highly commoditized and are accessible to investors at significantly lower fees than the amounts typically charged by hedge-fund managers, investors often subtract traditional risk premia from hedge-fund excess returns to more accurately access performance. The resulting returns are commonly referred to as Jensen's alpha (1967)[25]: the regression intercept of hedge fund excess returns against equity and fixed income returns over the risk-free rate.

We believe that the classic Jensen's alpha determined using traditional systematic equity and fixed income factors can be further deconstructed into returns associated with alternative risk premia and residual returns, which we consider "true alpha."

Exhibit 82



Alternative risk premia represent the potential reward associated with taking on systematic risk factors beyond traditional equity- and bond-market risk. Well-known alternative risk premia include value, momentum, quality, and carry. The fundamental sources of such risk premia have been well studied in academia and the evidence of their existence has been widely observed across equities, fixed income, commodities, and currencies. Other examples of alternative risk premia include variance risk premium (the imbalance of supply and demand associated with hedging in the options market) and risk premium on catastrophe bonds (the transfer of natural-disaster risk to bond holders from insurance companies).

As alternative risk factors are orthogonal to traditional risk factors, they contribute to improving the risk-adjusted return potential of a multi-asset portfolio by providing diversification benefits. Despite increasing investor awareness and interest, alternative risk premia are not nearly as commoditized as traditional risk premia. A hedge-fund manager's ability to accurately capture such alternative risk factors and to execute efficiently still plays a critical role in delivering the expected risk premia to investors. Nonetheless, it is important to recognize that such a skillset is differentiated from a hedge-fund manager's ability to generate "true alpha" that is not explained by – and thus not limited by – systematic risk factors.

This circles back to our belief mentioned earlier. Hedge fund excess returns can be deconstructed into three components: (1) traditional risk premia, (2) alternative risk premia, and (3) residual or "true alpha."

The deconstruction of returns provides insight into the fundamental drivers of future hedge-fund performance. We incorporate this approach in our methodology for developing expected long-term hedge fund returns across the nine strategies listed in below:

Exhibit 83

Global Macro Managed Futures	Fixed Income Relative Value Equity Market Neutral	Structured Credit Distressed / Restructuring Risk Arbitrage	Equity Long/Short (Long Bias) Activist

We first apply stepwise regression on our blended historical excess return series[i] for each hedge-fund strategy against the excess returns of broad-based equity and fixed income indices for which we have long-term forecasts[ii]. This method identifies a "blended portfolio" that consists of select traditional market indices.

The returns of the blended portfolio can be thought of as the "traditional risk premium component" of hedge fund returns. The rest of returns, identified as the regression intercept in the multi-factor model, represent the sum of any alternative risk premia captured as well as any true alpha delivered by the hedge-fund constituents within the strategy index.

[i] Proprietary blends of Hedge Fund Research HFRI Indices, Credit Suisse Hedge Fund Indices, Societe Generale CTA Index, Albourne Hedge Fund Database.
[ii] The indices selected are the benchmarks of the traditional long-only asset classes discussed in the Equities and Fixed Income sections of this paper.

Note that the value of R^2 produced by stepwise regression measures the collective predictability power of the "blended portfolio," as it represents the percentage of hedge-fund return variance that can be explained by variance in equity and fixed-income market returns. Separately, the coefficients assigned to the regressors represent the magnitudes of controlled and non-standardized sensitivity of hedge fund excess returns to the corresponding traditional market index excess returns. A high R^2 does not translate into large regression coefficients. For example, equity market excess returns have somewhat high predictability (R^2) of the excess returns of risk arbitrage hedge funds, as the probability of mergers or acquisitions breaking up tends to increase when the equity market becomes distressed (Mitchel and Pulvino 2000)[26]. Nonetheless, because the volatility of risk arbitrage hedge fund returns is typically much lower than the volatility of broad equity market returns, the regression coefficient assigned to equity market risk premium (e.g., excess returns of the MSCI ACWI index) is a fraction of the coefficient assigned to other risk premia (e.g., excess returns of the Barclays US Aggregate index).

Among the hedge fund strategies considered, global macro and managed futures produce the lowest R^2 values in our multi-factor regression models. This is somewhat intuitive and expected.

The excess returns of discretionary global macro strategies are primarily attributed to fund managers' skills in identifying and capitalizing on investment themes by directionally timing beta exposures across a broad range of markets and asset classes. Such themes may be developed from a top-down analysis of macroeconomic variables but are ultimately driven by individual managers' discretionary interpretation.

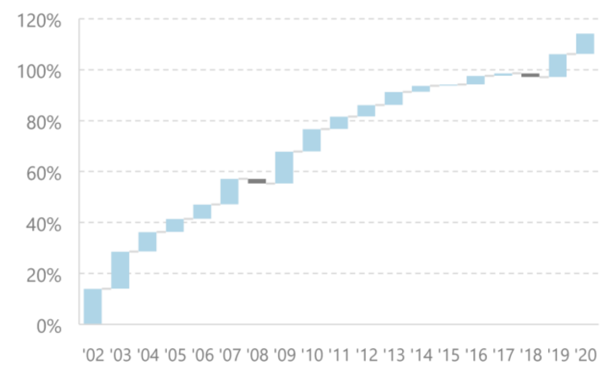
The excess returns of managed futures strategies tend to benefit from an environment characterized by persistent, discernable trending behavior. While such returns likely correlate with the equity markets in the short term, the predictability of the trending or momentum factors generally washes out over the medium to long term.

For these two strategies, we believe that there is no statistically significant predictability of long-term performance using traditional risk premia. Our estimates of their prospective excess returns are thus developed based on the historical performance of the respective hedge fund indices.

Global macro funds are generally expected to demonstrate stronger performance during severe market dislocations. While current geopolitical uncertainty presents potential opportunities going forward, returns of global macro have proven to be disappointing over recent years (4.3% annualized excess return 2011-2020) compared to the longer-term historical performance (7.3% annualized excess return 2002-2020), partially due to increased policy intervention. We apply the exponential smoothing method with a coefficient of 0.2 to historical annual returns. This method assigns greater weights to recent history – specifically 80% to index performance over the past six years – and generates an expected annual excess return estimate of 4.7%.

EXHIBIT 84

Global Macro Annual Excess Returns (net of fees)

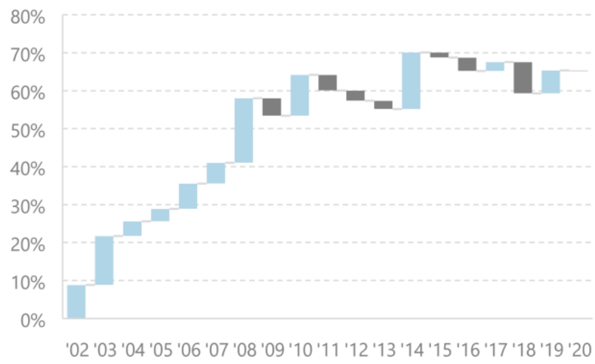


Source: Bloomberg. Credit Suisse Global Macro Index. Data from 2002 to 2020.

The Credit Suisse Managed Futures index peaked in Q1 2015; the Societe Generale CTA index peaked in Q1 2016. Managed futures funds overall have delivered negative cumulative total returns in recent years. Although the strategy is generally known to perform well in crisis periods, critics have questioned whether trend-following has become too crowded such that the strategy no longer offers a positive risk premium. We believe that the value of managed futures in a multi-asset portfolio primarily stems from its negative correlations with most traditional asset classes (as opposed to positive expected excess returns). By applying the exponential smoothing method discussed earlier with a coefficient of 0.1 and thereby assigning in aggregate 55% weight to index performance over the past six years, we obtain an expected annual excess return estimate of 1.8%.

EXHIBIT 85

Managed Futures Annual Excess Returns (net of fees)



Source: Bloomberg. Credit Suisse Managed Futures Index. Data from 2002 to 2020.

For the directional strategies (i.e., structured credit, long-biased equity long/short, and activist) as well as most of the generally non-directional strategies (i.e., fixed income relative value and risk arbitrage), we find meaningfully strong relationships ($0.5<R^2<0.7$) between the respective historical hedge fund index excess returns and the historical excess returns of broad-based equities and fixed-income indices. Equity market neutral strategy is the one exception where R^2 is only 0.15, with most of the variance explained by the regression model attributable to the equity market risk premium (i.e., excess returns of the MSCI ACWI index).

We construct the "traditional risk premia component" based on our long-term forecasts for the corresponding equity and fixed income indices (subtracting cash returns) and the coefficients determined by our multi-factor model.

Separately, we estimate the remaining expected returns that are not explained by traditional systematic risk factors to be the regression intercepts, which represent the sum of "alternative risk premia" and "true alpha."

We find that multi-factor models with extensive alternative risk factors produce more intuitive results when the models are used to assess individual hedge funds or indices with fairly homogeneous constituents; the regression results become much less relevant on the broad hedge-fund strategy level. For example, the strategy of equity market neutral consists of a heterogeneous mixture of hedge funds across sub-strategies covering both fundamental long/short as well as statistical arbitrage. The sub-strategies, by design, have materially different risk factor exposures. Deconstruction by alternative risk factor on the broad strategy level, therefore, does not generate meaningful insights into the drivers of expected future long-term returns.

PRIVATE INVESTMENTS

Private markets have seen powerful growth and undergone significant transformations since the end of the global financial crisis. As private markets continue to mature, we anticipate them to capture an increasingly greater fraction of global growth and evolve into essential asset classes like traditional public investments.

Institutions like pension funds, endowments, and sovereign wealth funds still remain the dominant group of investors in private markets; nonetheless, family offices and ultra-high-net-worth investors have substantially increased their allocations to private markets in recent years to boost long-term returns and enhance diversification.

To develop a framework for calibrating the appropriate allocations to private investments within a multi-asset portfolio, we discuss in the following section our long-term expected returns for three main asset allocations within private markets: (1) private equity, (2) private debt, and (3) private real estate. We develop our strategic and secular return forecasts for the private asset classes by assessing their correlations to public asset class counterparts, comparative leverage ratios, and potential excess returns that are attributable to liquidity premium.

Private Equity

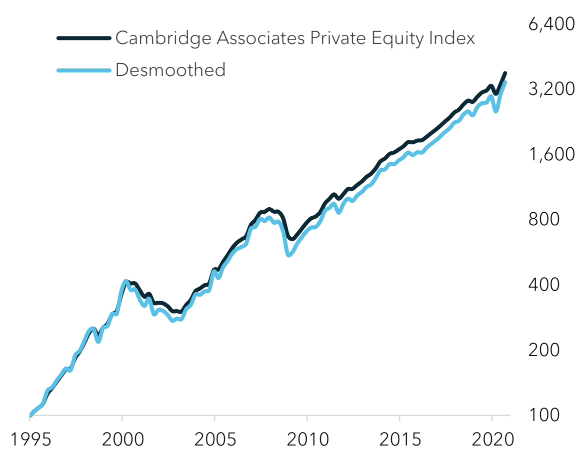
Private equity is the largest asset class within private markets. The popularity of private equity – evident in the growth of AUM, which is now about one-third the size of actively managed US equity mutual funds – is primarily driven by its relative strong long-term returns compared to public equity.

Some have also attributed the attractiveness of private equity to its superior risk-adjusted return. However, we believe this superiority may be overestimated due to the low frequency of return data and the commonly applied appraisal-based valuation method that results in highly smoothed return series.

To uncover the true systematic equity market risk exposure of private equity and to better understand the contributing factors to private equity's historical outperformance, we construct a replicating time series of private equity returns by de-smoothing the raw reported quarterly returns of the Cambridge Associates US Private Equity index. We assume an AR(1)[i] model and correct for the autocorrelation characteristics by applying the Geltner method. The intuition of the Geltner method is that true market returns can presumably be gained from appraisal-based returns by removing the predictable portion of the returns.

EXHIBIT 86

Historical Returns of US Private Equity



Source: Cambridge Associates. Data from 1995 to 2020.

We find that the volatility of de-smoothed returns is 50% greater than the naively measured volatility of raw reported index returns over the period of 1995 to 2020.

To develop our long-term expected returns for private equity, we seek to decompose the asset class' outperformance relative to public equity into presumably

[i] We found statistically significant dependence between reported quarterly returns and returns reported for the preceding quarter.

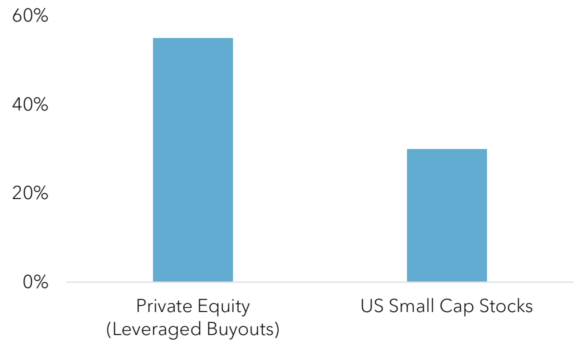
high beta (i.e., leveraged exposure to systematic equity market risk factor) and liquidity premium.

According to the World Federation of Exchanges, the number of US public companies in 2020 is roughly half the peak number in the late 1990's. This is in part because fewer smaller companies are going public due to tighter regulations as well as acquisition activities funded with low interest rates. Research by Goldstein, Zhao, and Yu in 2018 finds that private equity's portfolio companies have approximately twice the financial leverage of small-cap public companies[27].

EXHIBIT 87

Average Debt-to-Enterprise Value

2006 - 2017



Source: Empirical Research Partners Analysis.

Note that, as our ultimate objective is to estimate the prospective performance of private equity in the context of other asset classes, we evaluate performance on an after-fee basis. We believe that the impact of higher leverage and higher excess returns is less than two times due to the dampening effect of performance fees charged. Applying a moderate downward adjustment, we assume an estimated effective leverage ratio of 5:3 for private equity versus small-cap public companies.

Regression of de-smoothed excess returns of private equity versus excess returns of US small-cap stocks (i.e., the Russell 2000 index) finds a correlation of 0.75. This finding indicates that private equity has a beta of approximately 1.25 to US small-cap stocks.

Comparison of the geometric average of long-term historical private equity excess returns versus that of beta-adjusted US public small-cap companies' excess returns over the same period suggests an average annual liquidity premium of 2.2% for private equity. We acknowledge the time-varying nature of liquidity premia across asset classes. Private equity is no exception. Private markets overall have been facing mild headwinds from a valuation perspective as managers struggled to put capital to work. Fundraising has been down mildly in recent years versus the 2017 peak partially due to the magnitude of accrued dry powder (McKinsey 2019)[28]. While some have argued that there may be a case for negative risk premium going forward given the elevated levels of dry powder and the corresponding headwinds that richer valuation pose to future investment returns, we believe that increasing sophistication and depth of private markets offer balance and risk mitigation on the downside. Our long-term forecasts for private equity overall assume zero illiquidity risk premium.

Private Debt

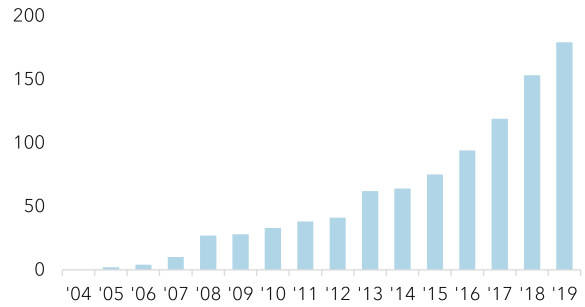
Cambridge Associates (2017) categorizes private debt investments into two sub-asset classes: (1) capital preservation; and (2) return maximization[29]. The former represents investments such as senior debt and specialty finance, which offer a left-skewed risk profile similar to that of traditional public debt with greater yields driven by the liquidity premium. The latter represents investments such as distressed corporate debt, which offers a right-skewed risk profile and is viewed as an alternative approach to accessing private equity exposure with somewhat greater downside protection due to the more favorable capture structure.

In this paper, we concentrate our definition of private debt on middle market direct lending, effectively excluding BDCs (publicly traded business developed companies that invest in middle market private debt) as well as broadly syndicated bank loans.

Private middle market lending has seen a dramatic takeoff in the past decade. Within the US, direct corporate loans by non-bank lenders now represent nearly $200 billion in asset value. This is driven by a combination of structural shifts on both the supply side and the demand side.

EXHIBIT 88

US Direct Lending AUM ($Billion)



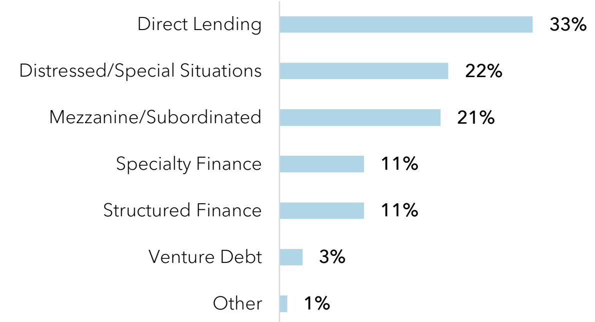
Source: Preqin Research. Data as of June 2019.

The significant consolidation of regional banks beginning in the 1990s resulted in a decline in capital supply to small and medium-sized companies, as national banks preferred to focus on larger borrowers. In addition, the introduction of bank regulations such as Dodd-Frank and Basel III in the aftermath of the global financial crisis led to a transition by traditional bank lenders towards the business model of loan underwriting and syndicating, which allowed banks to offload most of the credit risk from their balance sheets. This resulted in non-bank lenders such as institutional investors becoming increasingly more important sources of capital to loan borrowers. Small and medium-sized companies, however, generally do not have access to the broadly syndicated loan markets. The void in capital supply to small borrowers, coupled with a decline in interest rates in the past decade, led to the rise of direct middle market lending as institutional investors searched for alternative sources of attractive yields. The overall decline in the number of public companies in the US in the past two decades and the corresponding growth of the private equity market furthered fueled demand for financing solutions in the private markets.

In our view, private direct lending debt offers the potential for greater diversification within fixed income by providing exposure to middle-market lending and sponsor-owned company financing, to which public debt markets currently offer minimal exposure. Given the typical floating rate structure, private debt should also outperform traditional fixed rate public debt, adjusting for underlying credit fundamentals, in a rising interest rate environment.

EXHIBIT 89

Percentage of LPs Planning to Increase Allocation (%)

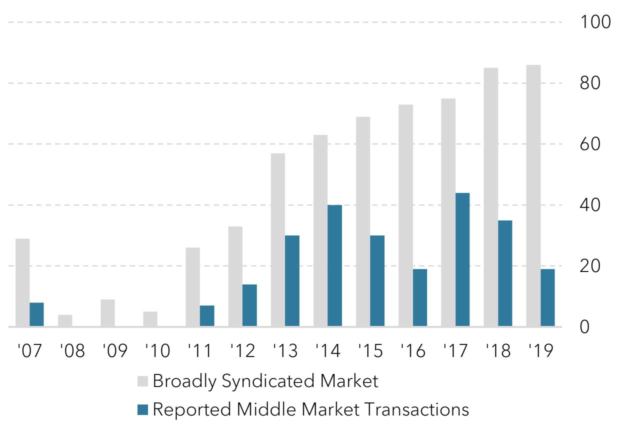


Source: Private Debt Investor Annual Survey. Data as of June 2020.

Yields on the Cliffwater Direct Lending Index, which is designed to measure the unlevered, gross of fees performance of reported US middle market corporate loans, have averaged over the past 15 years 5.0% higher compared to US high yield corporate bonds and 6.0% higher compared to broadly syndicated bank loans.[i]. Although some of the excess yields should reflect a combination of expected future credit losses as well as credit risk premium, we believe that a substantial portion of the excess yields are also driven by sustained supply and demand imbalance and illiquidity risk premium.

EXHIBIT 90

Cov-Lite Loans as Percentage of New Issue Volume (%)



Source: Refinitiv, Ares. S&P LCD. Data as of Q4 2019.

[i] S&P/LSTA Leveraged Loan Index

The rise of "cov-lite" loans in recent years has primarily been concentrated in the broadly syndicated loan market. Relative to broadly syndicated loans, direct middle market loans overall have exhibited lower credit riskiness. The 15-year average historical default rate of middle market loans is 3.1% (versus 5.6% for broadly syndicated loans). The average recovery rate for middle market loans is also higher at 81% (versus 75% for broadly syndicated loans).

We formulate our expected returns for private debt following a similar methodology as the one for private equity. We build upon our forecasts for US high yield corporate bonds, incorporate a beta adjustment to account for the estimated net effects of leverage and fees, and overlay our estimated ex ante excess risk premium. We believe that the illiquidity risk premium observed in the past is likely to sustain in the near term given the anticipated lender friendly environment following the pandemic crisis. However, as the private debt market continues to grow and mature, the illiquidity risk premium is expected to eventually compress over the long term.

Private Real Estate

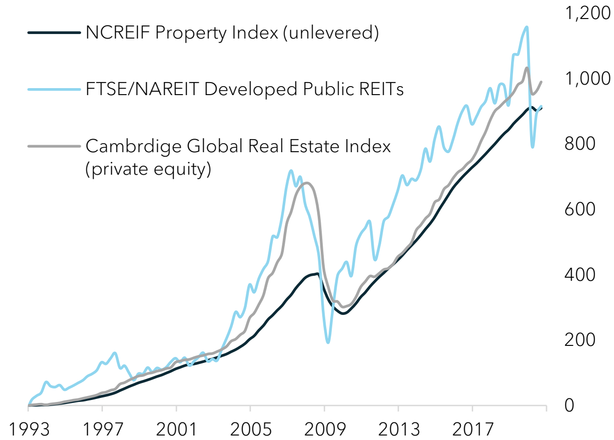
Following years of muted capital inflows after the global financial crisis and the burst of the housing bubble, we have seen a notable recovery of investor interest and confidence in real estate investments.28

Investors generally view private real estate as a hybrid asset class as it captures both the characteristics of private equity (i.e., capital appreciation) and private debt (i.e., income). There are multiple ways that investors can access exposure to real estate, including publicly listed REITs, commingled private real estate equity funds, co-investments, and direct ownership.[30] The different real estate investment structures offer varying degrees of advantages and disadvantages in terms of liquidity, accessibility, ease of execution, potential degree of diversification, control of the investment holdings, and access to niche sectors.

Until the COVID-19 crisis in 2020, public REITs have produced the greatest cumulative total returns, and the NCREIF Property Index, which measures the performance of direct, unlevered real investments, returned the least. In our view, the outperformance by the public REITs is strongly linked to the embedded leverage. In addition, the Cambridge Global Real Estate Index is designed to reflect the performance of private equity funds investing in real estate. Such funds may employ strategies across the risk spectrum, from core to opportunistic.

Exhibit 91

Cumulative Real Estate Index Performance by Investment Structure (%)



Source: Bloomberg. NCREIF Property Index, FTSE/NAREIT Developed Total Return Index, Cambridge Global Real Estate Index. Data from January 1993 to September 2020.

We acknowledge that private real estate indices such as the NCREIF Property Index and the Cambridge Global Real Estate Index suffer much of the same appraisal-induced drawbacks as private equity indices. To correct for the autocorrelation in the return series, we apply the method developed by John Okunev and Derek White in 2003, which generalizes the Geltner method by using the same reasoning to correct serial correlations of higher orders than one[31]. Comparison of the de-smoothed excess returns of the two private real estate indices from

1993 to 2020 against the excess returns of public REITs[i] on a beta-adjusted basis indicates no strong evidence of illiquidity risk premium, likely due to the multiple options available to investors to access the real estate opportunity set. Given such, we believe that, adjusted for leverage and index composition weightings, the return potential across various vehicles should ultimately be driven by the performance of direct real estate holdings over the long term. Such observation is consistent with extensive academic literature findings on this topic.

Private real estate AUM breakout by strategy in recent years indicates that investors in private real estate have gradually shifted down the risk curve and have shown an increasing interest in core and core-plus strategies that focus more on income as opposed to alpha generation.28 This is likely driven by investors increasingly identifying their allocations to private real estate as fixed-income substitutes with higher yields, greater tax efficiency, and modest equity beta in the form of capital appreciation potential. We expect such preference to persist and potentially strengthen, given our medium to long-term outlook on inflation and rates. As a result, we concentrate our definition of private real estate on the core/core plus segment – as opposed to the value-added or opportunistic segments – of the market.

We formulate our long-term return forecasts for private real estate investments using the NCREIF Property Index as a starting point. We assume a long-term cap rate of 5.0%, which is just above the lower bound of cap rates on the index in the past decade. We then make the relatively conservative assumption that long-term appreciation potential is in line with our inflation expectations. We incorporate a beta adjustment to account for the estimated net effects of modest leverage as well as interest and fee expenses.

[i] Benchmark FTSE EPRA/NAREIT REIT Total Return Index.

VOLATILITY ESTIMATES

2021 Volatility Assumptions for Public Equities, Traditional Fixed Income, & Commodities (%)

TABLE 6

	Semivariance-Adjusted	*Raw*	*Adjustment*	Skewness
US Equities				
US Equities All Cap	15.7	14.8	+0.9	-0.6
US Equities Large Cap	15.3	14.5	+0.8	-0.6
US Equities Mid Cap	18.2	17.1	+1.1	-0.7
US Equities Small Cap	20.1	19.1	+1.0	-0.5
Developed International Equities				
Developed Int'l Large & Mid Cap	17.4	16.7	+0.7	-0.4
Europe ex-UK	*19.4*	*18.5*	*+0.9*	*-0.5*
UK	*16.9*	*16.7*	*+0.2*	*-0.1*
Japan	*16.0*	*15.7*	*+0.3*	*-0.2*
Pacific ex-Japan	*21.1*	*20.4*	*+0.7*	*-0.4*
Canada	*20.1*	*18.9*	*+1.2*	*-0.6*
Developed Int'l Small Cap	19.5	18.1	+1.4	-0.8
Emerging Markets Equities				
Emerging Markets Large & Mid Cap	23.7	22.4	+1.3	-0.6
EM Asia	*23.8*	*23.2*	*+0.6*	*-0.2*
EM Europe, Middle East & Africa	*25.0*	*23.7*	*+1.3*	*-0.5*
EM Latin America	*32.0*	*30.4*	*+1.6*	*-0.5*
Emerging Markets Equities Small Cap	23.9	22.7	+1.2	-0.5
Global Equities				
Global Equities Large & Mid Cap	16.1	15.2	+0.9	-0.6
Global Equities Small Cap	18.7	17.3	+1.4	-0.8
Yield Enhancement				
REITs	19.3	17.9	+1.4	-0.8
MLPs	22.3	22.3	+0.0	-0.0
Ultra-Short Fixed Income	0.4	0.5	-0.1	1.2
Tax Exempt Municipal Bonds				
Tax Exempt Inv. Grade – Short Term	1.4	1.4	-0.0	0.2
Tax Exempt Inv. Grade – Intermediate Term	4.1	3.9	+0.2	-0.6
Tax Exempt Inv. Grade – Long Term	6.2	5.6	+0.6	-1.1
Tax Exempt High Yield Muni	8.2	7.1	+1.1	-1.5

US Taxable Fixed Income				
US Taxable Inv. Grade – Short Term	1.2	1.3	-0.1	0.6
Short Term Treasury	*1.3*	*1.4*	*-0.1*	*0.9*
Short Term Corporate	*2.8*	*2.4*	*+0.4*	*-1.8*
Short Term Securitized	*1.2*	*1.3*	*-0.1*	*1.0*
US Taxable Inv. Grade – Intermediate Term	3.0	2.9	+0.1	-0.3
Intermediate Term Treasury	*4.2*	*4.2*	*-0.0*	*0.1*
Intermediate Term Corporate	*5.9*	*5.2*	*+0.7*	*-1.4*
Intermediate Term Securitized	*3.0*	*3.0*	*-0.0*	*0.0*
US Taxable Inv. Grade – Long Term	8.9	9.0	-0.1	0.1
Long Term Treasury	*11.4*	*11.7*	*-0.4*	*0.3*
Long Term Corporate	*10.0*	*9.5*	*+0.5*	*-0.5*
US Taxable High Yield Corporate	10.6	9.5	+1.2	-1.2
US Preferreds	7.2	6.2	+1.1	-1.7
US TIPS	5.8	5.3	+0.4	-0.8
Developed International Fixed Income	2.9	2.8	+0.0	-0.1
Emerging Markets Fixed Income				
EM Sovereign Debt – Hard Currency	10.4	8.6	+1.9	-2.2
EM Sovereign Debt – Local Currency	13.4	12.6	+0.8	-0.6

Commodities				
Commodities ex-Precious Metals	18.1	17.1	+1.0	-0.6
Precious Metals	17.2	17.3	-0.1	+0.1

2021 Volatility Assumptions for Hedge Funds (%)

TABLE 7

	Adjusted	*Raw*	*Adjustments*[i]
Hedge Funds			
Global Macro	7.8	4.7	+3.1
Managed Futures	10.8	8.8	+2.0
Fixed Income Relative Value	7.7	5.2	+2.5
Equity Market Neutral	5.9	3.5	+2.4
Structured Credit	8.9	5.7	+3.2
Distressed / Restructuring	9.7	6.4	+3.3
Risk Arbitrage	5.3	3.7	+1.5
Equity Long/Short (Long Biased)	9.9	8.2	+1.7
Activist	15.4	13.9	+1.5

[i] Adjustments are a combination of adjustments for skewness, smoothing effects, and hedge fund index biases.

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