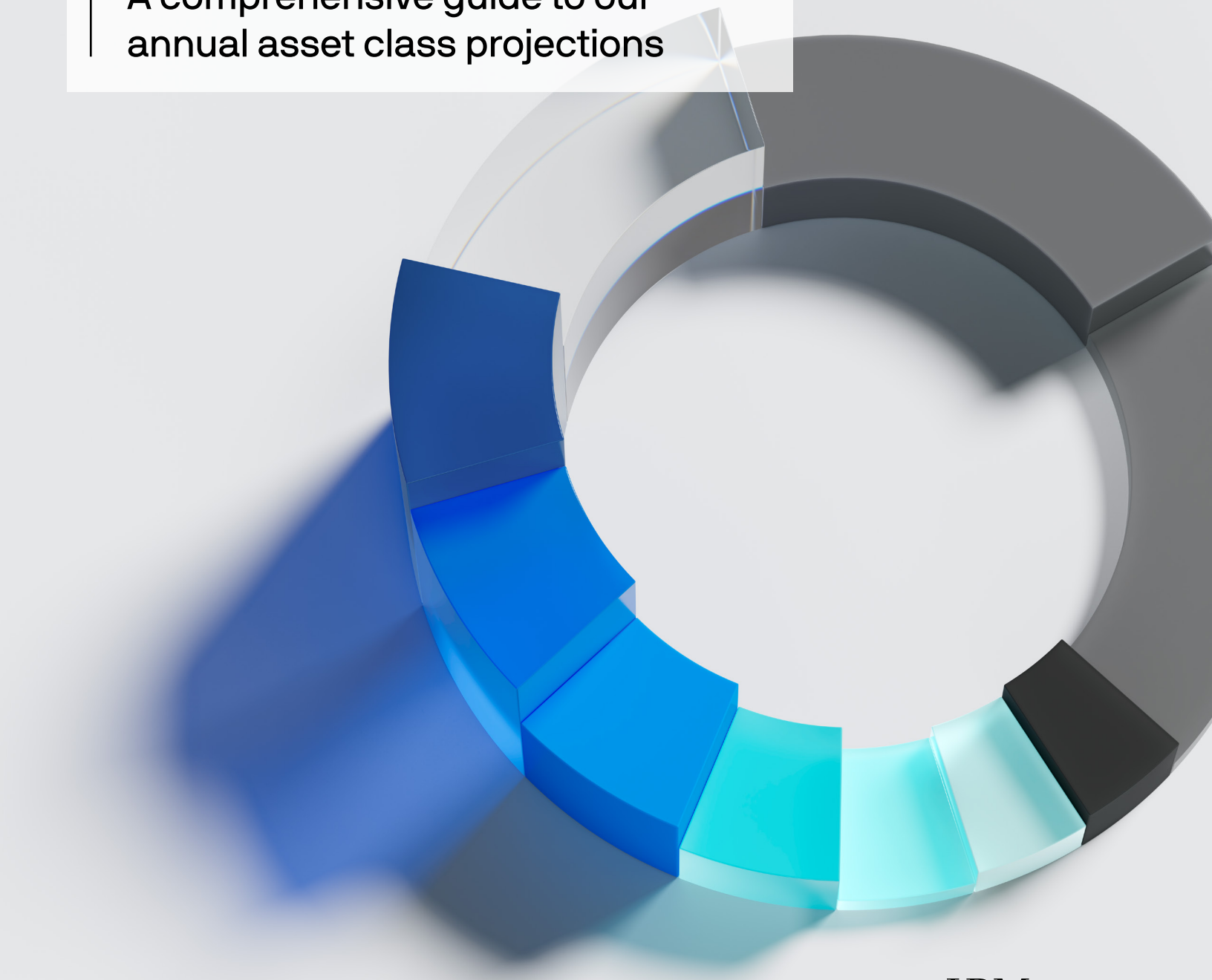
Portfolio Insights

Long-Term Capital Market Assumptions: Methodology Handbook

A comprehensive guide to our annual asset class projections



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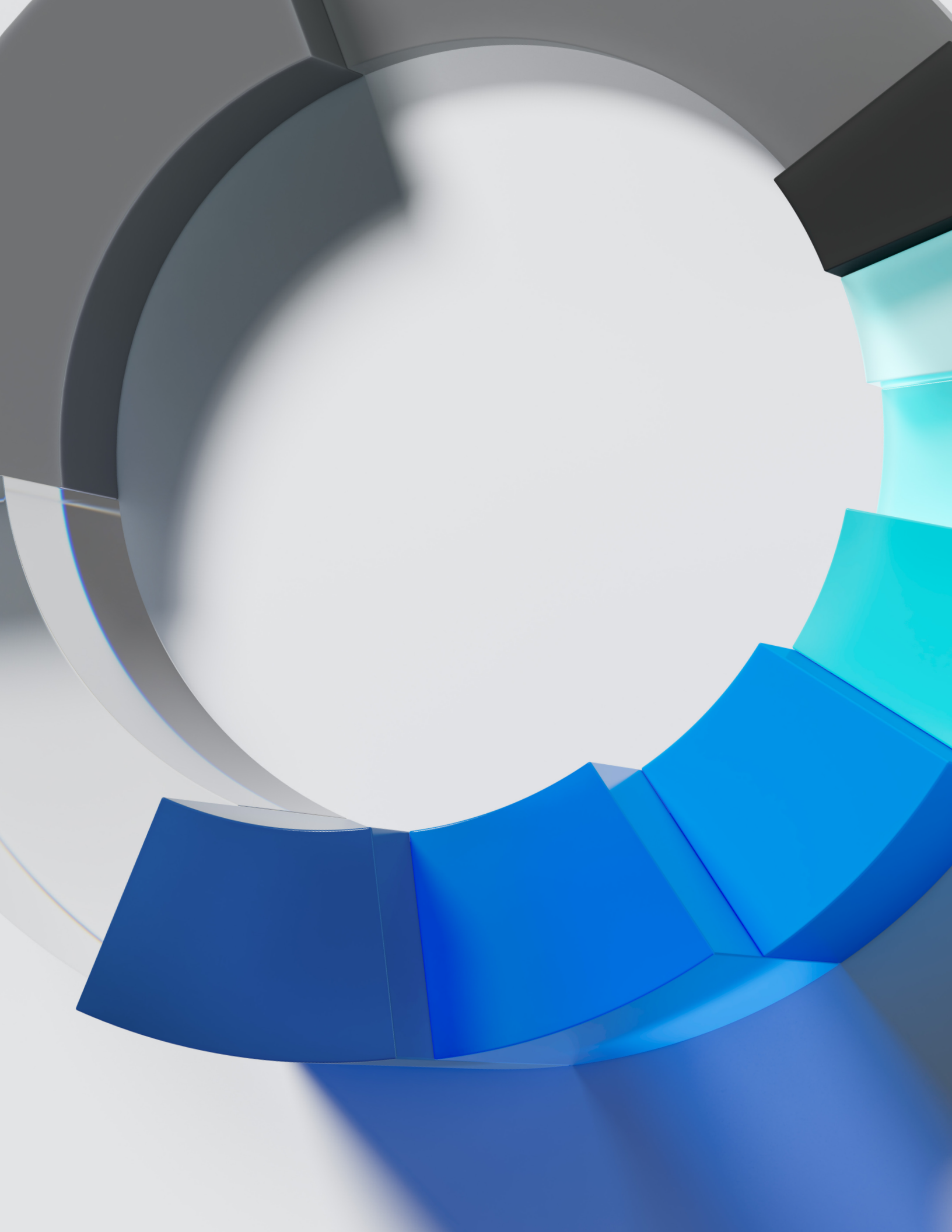
J.P.Morgan
ASSET MANAGEMENT





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Introduction

J.P. Morgan's proprietary Long-Term Capital Market Assumptions (LTCMAs) represent more than three decades of cumulative experience and institutional knowledge from a broad range of investment professionals, both past and present. Over the decades, the range of instruments has broadened, the methodology has evolved, and the depth of analysis has expanded. As of 2027, the LTCMA program offers forward-looking projections for asset class returns, volatility and correlation across more than 200 asset and strategy classes in 20-plus base currencies.

Now in its third iteration, the LTCMA *Methodology Handbook* is designed to provide investors with an explanation of the construction of these estimates. Here, we start with an important acknowledgment of the core guiding principles behind the program, including the five objectives that we expect to remain consistent over time.

Our objectives

Solve for portfolio-level outcomes

The LTCMAs' overarching objective is to provide 10- to 15-year expected return, risk and correlation forecasts to help us – and our clients – build more robust portfolios. While we attach rigor to the formulation of the individual asset class returns, ultimately we are trying to solve for portfolio-level performance. This emphasis is reflected in the importance we attach to the evolution of the 60/40 stock-bond portfolio and, increasingly, the portfolio utility of alternative asset classes.

Build a forward-looking, supply-side model of the economy

As our starting point, we begin formulating our LTCMAs in the context of a forward-looking expectation of the global economy's contours over the forecast period. While the past can be a guide, we have not designed the LTCMAs to be an exercise in mean reversion. We identify major themes that we perceive to be the key drivers of the global economy through the forecast horizon and will have a meaningful impact on the trajectory of growth through three channels: the labor force, productivity and capital formation. These themes also inform our thinking on the development of inflation and interest rates. These economic assumptions then flow coherently through to our the asset class forecasts, influencing our views on key assumptions such as the shape of the fixed income curve, borrowing costs and margin trajectories.

Reflect the organization's expertise through continual process enhancements

While the forecasting of a 10- to 15-year return inherently represents a top-down exercise in economic forecasting and asset class modeling, over time we have looked to enrich the methodology by incorporating insights from the J.P. Morgan Asset Management research organization. Where appropriate, we have folded in the fundamental, bottom-up insights of our investors and researchers who track these assets on a day-to-day basis. At a minimum, we seek to understand how they see the evolution of the key drivers of return and risk through the first half of our forecast horizon.

In this year's edition, we highlight updates that we have made to the real asset and private equity return assumptions within alternatives; for regular users of this document, a review of these sections would be recommended. For the first time, we introduce return assumptions for bitcoin.

Make a central case forecast

The numbers published in the book represent our central case forecast; where we have uncertainty, we look to reflect this in the volatility numbers. Thus, while an inherent bias exists to focus on the return side of the forecasts, to fully understand the implications, investors need to give relevant consideration to the volatility and resultant Sharpe ratios of the asset classes. We also emphasize the importance of considering our risk scenarios, both to the upside and the downside.

Provide transparency

A key facet of the program, exemplified by the handbook, is our desire to provide transparency. We want our clients to understand – and be comfortable with – the construction of our asset class forecasts, as well as some of the key assumptions that inform our central case. We believe that our methodology handbook and the narrative drivers of the main book can provide a solid foundation for our clients to be able to adjust these forecasts to reflect their own baseline expectations.

This companion piece is intended for investors who want to understand the numbers in greater depth. Designed as a centralized reference, the handbook serves as an evergreen repository for systematically describing and recording our approach to developing the annual LTCMAs. Here, analysts in each asset and strategy class we cover explain some key aspects of their research, procedures and rationales.

Philosophy of the LTCMAs

For the LTCMAs to be useful to investors, we believe they must achieve two key goals:

- The publication's numbers need to be internally consistent.
- Given the LTCMAs' 10- to 15-year time horizon, it is important not to compound errors throughout the period. Hence, the return assumptions reflect our core expectations along with the level of uncertainty around that central scenario, which is reflected in the volatility of the return assumptions.

To achieve these goals, we use a transparent building block approach, based on both financial theory and market observations. At the base of the return assumptions sit our core views on real GDP and inflation (**Exhibit 1A**). GDP is forecasted through a production function that accounts for potential labor input growth, capital growth and productivity. Our inflation forecast accounts for central bank inflation targets, commitment to these targets and structural forces within an economy. Building on that foundation, all the LTCMA inputs flow through into the entire set of long-term assumptions (**Exhibit 1B**).

For the fixed income assumptions, the GDP and inflation rate forecasts inform our expectations for cash returns that in turn underpin the full set of fixed income returns. GDP growth rates also form the base of the equity return assumptions, and as such they feed into revenue assumptions and into the economies' growth differentials, informing our expectation for foreign exchange (FX) rates over the forecast horizon.

Similarly, we employ a building block approach to the construction of our private market return assumptions, integrating our macro outlook into the core components, such as rental growth for real assets and EBITDA growth for private equity. We then check the output of these return forecasts for consistency relative to our public market expected returns.

While the LTCMAs' development process is structured, the way we calculate returns, volatility and correlations is not formulaic, nor is it anchored on simple mean reversion to long-run historical averages. Rather, we develop as a central part of our calculations clear, forward-looking views on the characteristics of each asset and strategy class that we cover.

The LTCMA leadership team debates how changes in the market environment and/or market structure could cause structural shifts in asset class behavior and performance. Some themes are multi-year (or, indeed, multi-decade), and influence our forecasts through that channel. For others – climate economics in this year's edition – we include topical research papers in partnership with subject matter experts from across the firm.

Beyond individual asset class returns, their portfolio-level implications form another essential part of the assumptions. These are reflected in our annual performance expectation for a balanced global stock-bond portfolio, which rises 60 basis points (bps), to 7.0%,[1] but higher stock-bond correlation demands further diversification. Allocating 30% to diversified alternatives,[2] for example, pushes returns up to 7.5%, and risk-adjusted returns jump by 21% compared with a simple balanced portfolio. The robustness and implications of the volatility and correlation matrices, covered in this handbook, are particularly important in this context.

[1] All returns cited throughout the paper are in U.S. dollars.
[2] Our "diversified alternatives" model reflects allocations of 7.5% to core real estate, 7.5% other real assets, 7.5% to private equity, 4.5% to private credit and 3% to hedge funds.

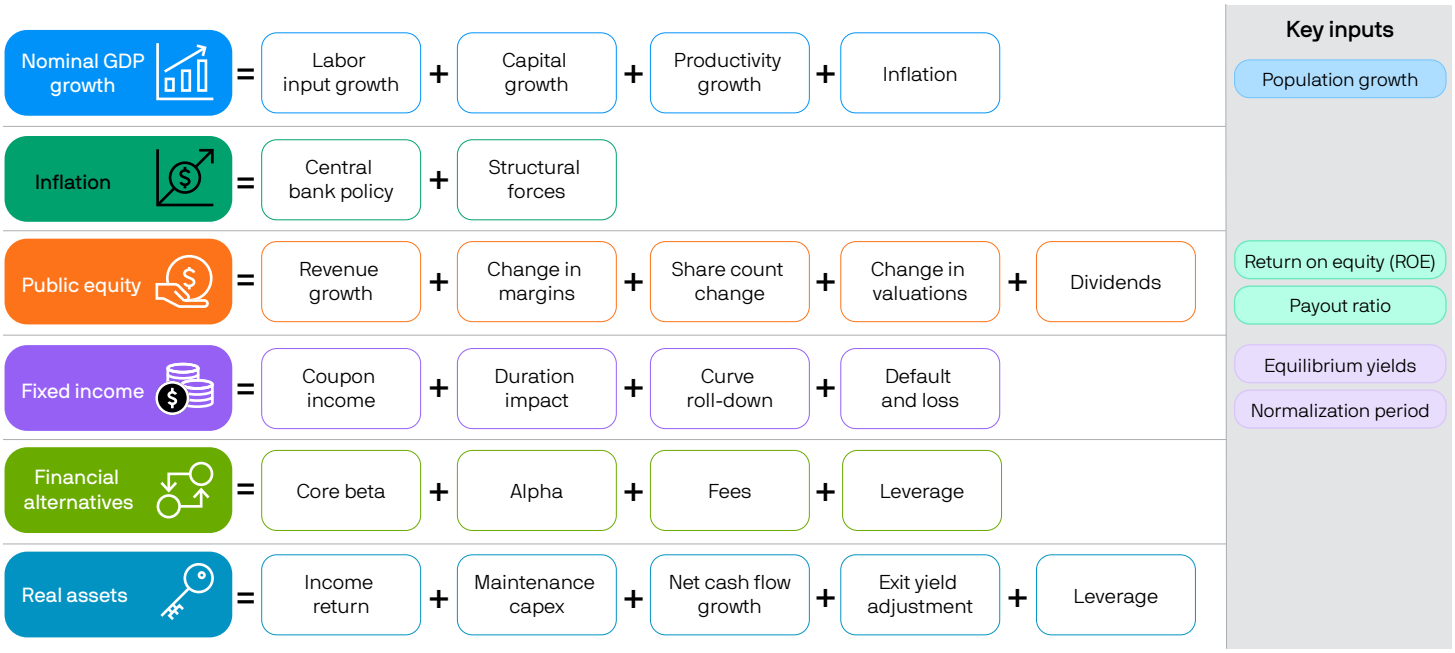
What may matter most about our LTCMA methodology building blocks is this: They allow for enlightening conversations with our clients, who can (and often do) stress-test specific components of the asset class returns. This transparency allows clients to swap out elements if they so choose.

Ultimately, the strongest proof that our LTCMAs are a valuable investing tool is that our clients choose to incorporate them into their own capital market assumptions.

We hope this companion to the annual LTCMA publication provides you with a valuable resource.

The trend real GDP and inflation building blocks provide base-level inputs

Exhibit 1A: LTCMA building blocks

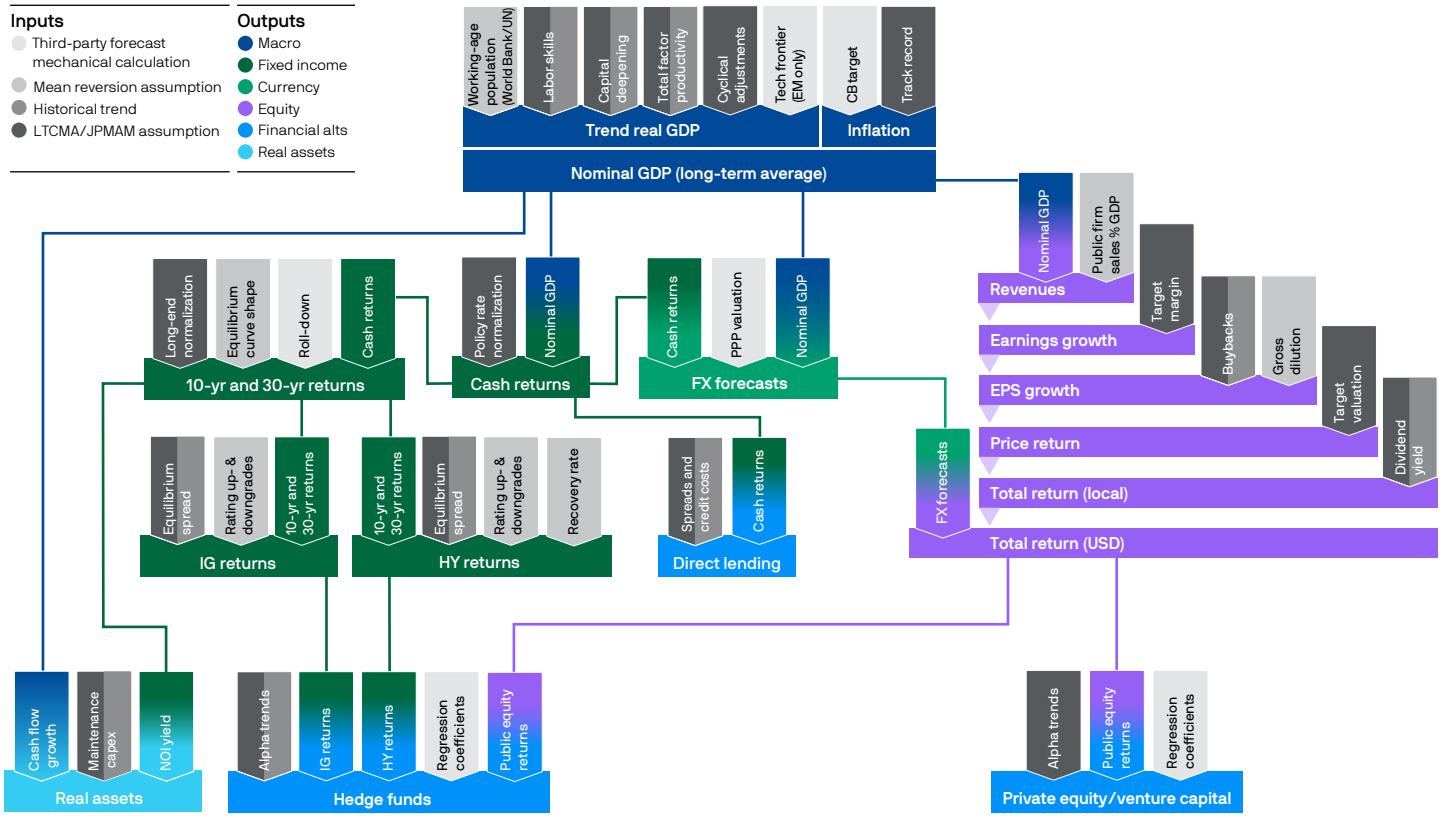


Source: J.P. Morgan Asset Management; as of September 30, 2026.

Note: As described in the private markets section, the methodology for financial alternatives is currently being updated to a sum-of-parts approach, which has been reflected this year in private equity.

Detailed schematic of LTCMA inputs and their flow through the entire assumptions set

Exhibit 1B: The building blocks flow through all the LTCMAs



Source: J.P. Morgan Asset Management; as of September 30, 2026.

Chapter 1

Macroeconomic assumptions methodology

Our annual macroeconomic assumptions are foundational to our Long-Term Capital Market Assumptions (LTCMAs). The following section explains how we forecast GDP growth and inflation – the economic drivers that shape the universe of asset class forecasts and provide our users with robust, consistent and data-driven guidance.

GDP model and methodology

The core of our long-term GDP growth[3] forecasts is a traditional Solow growth model. The Solow model relies on a Cobb-Douglas production function (see the equation below). On a basic level, this separates the drivers of long-run GDP growth into the supply of labor and capital, and an economy's productivity in combining them (referred to as total factor productivity, or TFP). This model can be broken down into growth rates, which form the basis of our projections. We use the following methodology to forecast these GDP components:

Labor input: We forecast labor as an input into the economy by estimating how the labor force will expand (or contract) over our 10- to 15-year time horizon. We start with projections of the working-age population, accounting for forecasted migration flows. We then transform this working-age population projection into an employment projection by making assumptions about labor force participation across different age and gender cohorts. Finally, we adjust this employment projection for changes in labor quality – mostly reflecting trends in education – and trends in average hours worked per person. (For example, an aging population tends to feature more part-time workers than a younger one.)

Capital input: We focus on investment to assess capital growth in each economy. Capital's contribution to GDP growth rises broadly in line with the expansion of the productive capital stock – including the machinery, equipment and intellectual property used in production – which in turn depends on each economy's public and private investment rates. We thus make assumptions about these investment rates, adjusting for the average pace of depreciation. (For example, technological capital tends to depreciate faster than traditional infrastructure.)

This year, we add a dedicated model of investment related to artificial intelligence (AI) to this framework for relevant economies, given the scale of the spending now flowing into data centers, semiconductor production and power generation. We project a path for that spending over our investment horizon, allocate it across structures, equipment and intellectual property, and depreciate each category at its own rate, since AI equipment becomes obsolete far faster than the structures that house it. We then discount the portion of that spending that we judge will displace other investment rather than add to it, and layer what remains onto a baseline that tracks how fast the capital stock might have grown without AI.

[3] Robert M. Solow, "A Contribution to the Theory of Economic Growth," *Quarterly Journal of Economics 70*, no. 1, February 1956.

Total factor productivity: This concept captures the economic growth that cannot be attributed to labor or capital growth in isolation. Over the long term, we believe TFP primarily reflects the pace of technological change – both at the global technological frontier and in each economy's position relative to that standard. Thus, in developed market (DM) economies, our TFP forecasts mostly reflect assumptions about the speed of innovation diffusion into each country's "real" (i.e., productive) economy. In emerging market (EM) economies, our TFP forecasts reflect assumptions about the pace of adoption of existing technological advancements.

This year, we adopt a new approach to estimating AI's contribution to TFP, using a task-based framework grounded in Hulten's Theorem.[4] We estimate the share of an economy's work that AI is capable of performing, how widely firms adopt AI and how much faster it performs the work specified. We scale the resulting gain by labor's share of income and phase it in along an S-curve to reflect the time firms need to reorganize around a new technology. We treat the result as an addition to each economy's underlying, non-AI productivity trend and explore the derivation in our topical paper for the 2027 LTCMAs, "A brighter productivity outlook for the AI era."

Combining inputs: To combine labor, capital and TFP into a GDP growth forecast, the Solow model requires a projection of how labor (broadly, employees) and capital (broadly, firms) "split" the gains of production. We use historical data to estimate these labor and capital shares of income for each economy. By combining these parameters (assumed to mirror each other in the Solow framework) with our labor, capital and TFP growth forecasts, we produce a 10- to 15-year trend GDP growth forecast.

$$Q = AL^{\alpha}K^{\beta}$$

Q	A	L	α	K	β
= real GDP	= total factor productivity	= labor	= marginal product of labor	= capital stock	= marginal product of capital

Cyclical adjustment: Finally, we determine whether a cyclical adjustment is necessary. For instance, in our 2022 and 2023 LTCMAs, economies were recovering from depressed, Covid-induced starting points, and the process of normalization had a material impact on the average growth rate during our forecast horizon.

Inflation model and methodology

In the near term, while inflation is sensitive to business-cycle fluctuations, supply imbalances and commodity prices, these effects tend to fade over time. In the long term, inflation is primarily determined by policy decisions and secular economic forces. Indeed, in the modern era, central bank inflation targeting and policy independence have improved monetary authorities' ability to lower (or boost) inflation by calibrating interest rates, financial asset purchases and inflation expectations.

[4] Charles R. Hulten, "Growth Accounting with Intermediate Inputs," *Review of Economic Studies 45*, no. 3, October 1978.

While the monetary policy toolkit has its shortcomings, it remains the most influential guide to long-run inflation. As such, our inflation methodology begins with a review of the inflation targets of central banks across the major developed market and emerging market economies.

Exhibits 1A and **1B** outline the current stated policies of the major DM and EM central banks. Generally, DM central banks have an official target centered around 2%, with only a small range in nuance between, for example, the Swiss National Bank, which would prefer to maintain an inflation rate below 2%, and the Reserve Bank of Australia, which targets inflation of 2%–3%. EM central bank targets are generally somewhat higher.

Central banks' stated policies are one of the strongest determinants of inflation over the long term

Exhibit 1A: Developed market central bank inflation policies

Central bank (CB)	CB inflation target	Current inflation policy	Source
U.S. Federal Reserve	Headline PCE	Targets longer-run inflation of 2%	Statement on Longer-Run Goals and Monetary Policy Strategy (revised August 2025; reaffirmed January 2026)
European Central Bank	HICP	Symmetric 2% target over the medium term; positive and negative deviations treated as equally undesirable	Monetary policy strategy statement (June 2025)
Bank of England	Headline CPI	Sets policy to meet 2% inflation target while helping to sustain growth and employment	Remit for the Monetary Policy Committee (November 2025)
Bank of Japan	Headline CPI	Aims to achieve price stability target of 2% at the earliest possible time	Framework for the Conduct of Monetary Policy (January 2013)
Bank of Canada	Headline CPI	Aims to keep inflation at the 2% midpoint of a target range of 1% to 3%	Monetary policy framework (renewed December 2021)
Reserve Bank of Australia	Headline CPI	Aims to achieve a medium-term average rate of inflation of 2% to 3%	Statement on the Conduct of Monetary Policy (July 2025)
Swiss National Bank	Headline CPI	Aims to achieve positive rates of inflation of less than 2%	Monetary policy strategy (in place since 2000; reviewed 2022)
Swedish Central Bank	CPIF	Aims to achieve 2% inflation, with a tolerance range of 1% to 3%, and also to contribute to balanced growth and employment	Monetary policy report (September 2017); Sveriges Riksbank Act (in force January 1, 2023)

Source: J.P. Morgan Asset Management; data and forecasts as of September 2026. PCE: personal consumption expenditures; HICP: Harmonized Index of Consumer Prices; CPI: consumer price index; CPIF: CPI with a fixed interest rate.

Exhibit 1B: Emerging market central bank inflation policies

Central bank (CB)	CB inflation target	Current inflation policy	Source
People's Bank of China	Headline CPI	Sets its 2026 target at around 2%. The PBoC does not publish a long-term inflation target	2026 Government Work Report of the Chinese State Council (March 2026)
Reserve Bank of India	Headline CPI	Targets 4% for 2026–31 with a 2% point tolerance band on either side	Ministry of Finance notification under Section 45ZA, RBI Act (March 2026)
Bank of Brazil	Headline IPCA	Targets 3% with a 1.5% point tolerance band on either side	Resolution CMN 5,141 (effective January 2025); target set by the National Monetary Council
Bank of Mexico	Headline CPI	Targets 3% with a 1% point tolerance band on either side	Monetary program (permanent target since 2003)
Bank of Korea	Headline CPI	Targets inflation at 2% over the medium term	Monetary policy for 2026, Bank of Korea (December 2025)
Central Bank of the Republic of China (Taiwan)	Headline CPI	Flexibly follows a 0%–2% target; uses money supply growth to stabilize prices	Central Bank Act; quarterly board meeting press releases
South African Reserve Bank	Headline CPI	Targets 3% with a 1% point tolerance band on either side, replacing the previous 3% to 6% range	Joint National Treasury/SARB announcement (November 2025)
Central Bank of the Republic of Turkey	Headline CPI	Current target of 5% year-over-year (y/y) as of year-end, with a 2% point tolerance margin on either side. Targets are set jointly with the government for three-year periods	Monetary policy for 2026 (December 2025)

Source: J.P. Morgan Asset Management; data and forecasts as of September 2026. CPI: consumer price index; IPCA: extended national consumer price index.

Most central banks use a consumer price index (CPI) target, but there are exceptions. Notably, the U.S. Federal Reserve (Fed) targets the personal consumption expenditures (PCE) deflator, which incorporates a slightly different methodology, leading the measure to regularly run lower than the CPI. The size of the gap between CPI and PCE has varied over time; in the 15 years before the pandemic, it averaged roughly 30 basis points. In our analysis, we use the PCE to generate an implied Fed CPI target of 2.30%.

We then account for certain long-term forces that tend to push inflation above or below these targets – largely outside the control or influence of monetary policy. These forces generally operate in the same direction across economies, but some are more nuanced to specific economic realities.

As with growth, we adopt a new approach to estimating AI's impact on inflation, specifically through the productivity channel. We model this effect by taking the economy-wide labor productivity gain from AI as a starting input and distributing it across the categories of the CPI basket based on those categories' exposure to AI. To estimate the category-specific exposure to AI, we utilize industry-level exposure scores developed by a trio of academic researchers, Edward W. Felten, Manav Raj and Robert Seamans.

We then estimate how much of each category's cost structure is impacted by the productivity gain, drawing upon industry labor cost shares and applying a multiplier to capture savings beyond labor, such as those from process improvements. The result is the cost savings we expect to accrue to each industry and in turn to each CPI category. Not all of those savings typically reach the consumer, however, so we also discount them by a pass-through rate calibrated to the competitive dynamics of each category. Finally, we weight the category-level effects by their CPI shares and sum them to arrive at the total inflation effect. In short, the model is the product of labor productivity gain, AI exposure, affected cost share, pass-through and CPI weight.

Another change this year is that we no longer model a separate "central bank targeting success adjustment." Instead, we fold that factor into our broader assessment of the long-term forces likely to push inflation above or below target. While applying weights to each long-term force is not an exact science, an assessment of their cumulative impacts suggests that some countries will persistently undershoot inflation targets while many others will persistently exceed them.

Finally, we assess whether it is necessary to make a transitional adjustment to our long-term inflation assumption to bring it toward the underlying trend. This was most relevant during the Covid-induced inflation surge of 2022 and 2023, when we determined that a period of transition would boost the average expected inflation rate over our 10- to 15-year forecast window as inflation gradually approached its long-term trend.

Chapter 2

Public market assumptions methodology

Long-Term Capital Market Assumptions (LTCMAs) for asset classes are categorized into public and private market investments. Public market assumptions cover traditional asset classes that are typically traded on public market exchanges. They include government fixed income, investment grade and high yield corporate credit, foreign exchange/currencies and equities.

Fixed income assumptions methodology

Our methodology for forecasting fixed income assumptions incorporates our understanding of the structural drivers underlying sovereign yields, the foundation of our cycle-neutral forecasts. Our corporate spread assumptions add two other forecasts: long-term average default levels and recovery rates.

What our government bond yield assumptions forecast

First, we provide an explanation of what our government bond yield assumptions are forecasting.

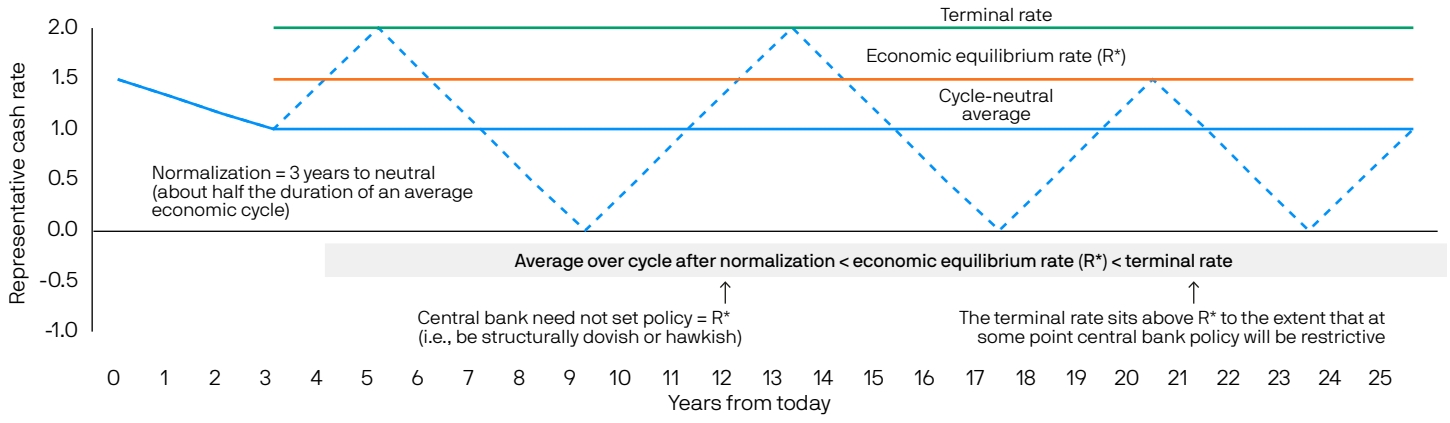
The LTCMA approach is to forecast what we believe yields will be, on average, over several cycles – "cycle-neutral" averages. To calculate these averages, we emphasize the structural drivers of interest rates and yield curves, and abstract away from the current point in the economic cycle.

Of course, we cannot ignore the fact that our starting point depends on current economic conditions. Hence, in order to calculate returns, we forecast a normalization period during which bond yields revert to cycle-neutral averages. These time periods can and do differ across tenors. **Exhibit 1** illustrates our approach.

It must be emphasized that a cycle-neutral average is not the same as a terminal rate or an economic equilibrium rate (R*). A terminal rate reflects a peak in yields, not the average over a cycle. "R*" is a theoretical and unobservable interest rate at which monetary policy is neither expansionary nor contractionary. The average yield over a cycle need not equal R*, especially if, on average, central bank policy is accommodative or restrictive.

We forecast the cycle-neutral average rates we expect after normalization – not R* or terminal rates

Exhibit 1: Cycle-neutral average, equilibrium and terminal rates – representative example



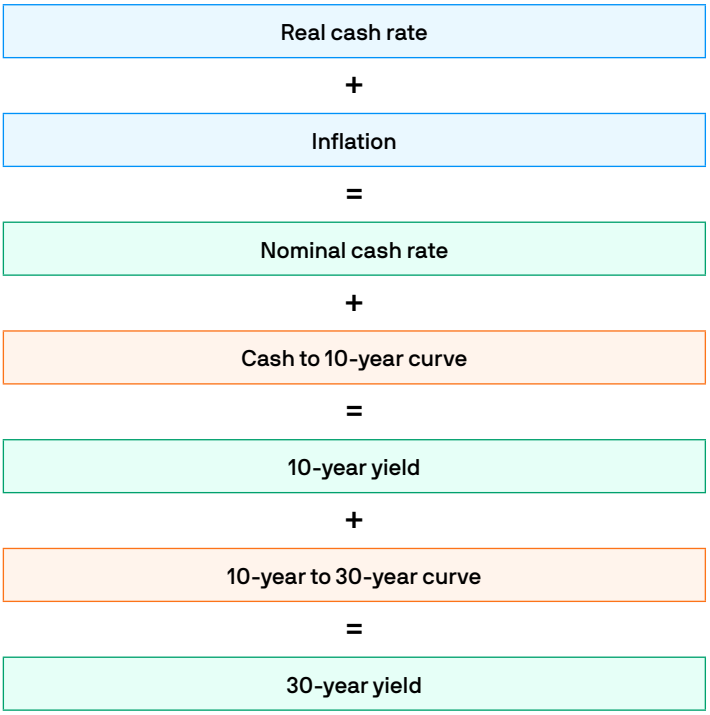
Source: J.P. Morgan Asset Management.

Fixed income yield building blocks

To forecast cycle-neutral government bond yields, we use a building block approach, starting from the short rate (**Exhibit 2**).

How we produce our fixed income return forecasts

Exhibit 2: LTCMA government bond yield building blocks, sovereign debt



Source: J.P. Morgan Asset Management.

Cash rate return assumptions methodology

We add the LTCMA inflation forecast to our cycle-neutral real cash rate to generate our nominal cash rate forecasts. Real cash rates tend to follow structural, long-term cycles. While we are not forecasting an economic equilibrium rate, our view on the direction of this theoretical concept does heavily influence the changes we make each year. Furthermore, central bank policy is key to determining where the cash rate will sit over several cycles.

Specifically, we derive our real cash rate using a 30-year average of real cash rates as a starting point, then incorporate changes to our trend growth assumptions and our views on the risks around inflation to adjust the real cash rate higher or lower than this long-run average.

From here, we estimate both a cash to 10-year curve to reach our cycle-neutral 10-year yield and a 10-year-to-30-year (10y-30y) curve to forecast our cycle-neutral 30-year yield. The cycle-neutral 10-year yield reflects our expectations for both the term premium and average rate hikes over a cycle.

Additionally, we tend to compare historical curve averages. For example, we incorporated quantitative easing (QE) through flatter curves pre-Covid and post-Covid, and we steepened yield curves to account for higher inflation uncertainty, increased fiscal activism and spending, and broadly higher term premia. Generally, our yield curve slope forecasts reflect the term premium and uncertainty of holding longer-duration assets over cash.

The 10y-30y curve is more technical. It is heavily influenced by supply and demand. On the supply side, our forecasting focuses on fiscal policy developments and issuance expectations. On the demand side, we concentrate on the structural drivers of demand, including from central banks, international investors and other long-term buyers.

Government bond return assumptions methodology

Once we have forecasted our cycle-neutral yield curve and normalization periods, we then calculate average returns over a 13-year period. We approach this task by calculating the one-year holding period returns for each year in our forecasts. For example, we calculate the average return for a 10-year constant maturity index by assuming the purchase of a 10-year government bond at the start of the year and its sale at year-end.

Once we reach our cycle-neutral averages, the components of the annual return are constant and include:

(i) the cash return

(ii) the carry (or slope)

(iii) the roll-down

Also:

(iv) During normalization, there will be a duration impact that reflects the capital gains (or losses) from the change in the constant maturity yield as we normalize. Furthermore, the returns from i, ii and iii will differ as we normalize.

We then average the returns over 13 years to calculate average annualized returns. It is often useful to break those down into a cycle-neutral return and a return from normalization to truly isolate the impact from the initial normalization period.

Corporate spread assumptions methodology

Our approach to corporate bond markets aims to forecast average market spreads over several cycles. To reach these cycle-neutral corporate spreads, we focus on what historical long-term spreads have been, adjusting them for any structural changes we believe have taken hold in the current market. We then use these average spreads, along with projected default and recovery rates, to estimate average yearly returns.

Corporate spread assumption building blocks

Simple index-level historical averages do not capture some of the underlying market dynamics that must be accounted for. To incorporate these dynamics into our spread assumptions, we take five steps:

1. Break the current index down into meaningful subcomponents

Specifically, we break the current index down into credit ratings and, where possible, maturities.

2. Calculate the average historical spread for each subsector/component

3. Duration-adjust historical average spreads to reflect changes in bond maturities

We have made this adjustment to the historical average spread levels in recent editions to reflect the past decade's trend of increasingly longer-maturity debt issuance, with its associated higher risk. To do this, we take the long-term average duration of each component and compare it with the more recent historical duration. We then use this ratio to adjust the historical spread levels.

4. Re-create index-level spreads using projected weightings

We then reweight the adjusted spreads from step 3 to reflect the current index composition and to incorporate our views of its likely future composition. Increasing the allocation to A rated securities in the investment grade index is an example of an adjustment incorporated during this step.

5. Add any qualitative adjustments to reflect other structural changes

A final step is incorporating any other structural shifts in the current market that may not have been factors historically, such as adjusting for central banks' corporate bond purchases.

Corporate bond return assumptions methodology

Once we have forecasted the markets' average spreads, we use the underlying sovereign yield forecasts to project all-inclusive yields over the whole 13-year horizon. The return calculations are similar to those we use for underlying rates; we also include our expectations for losses due to defaults.

Here, we produce two assumptions: first, our expectation of average default levels over the period; second, our view on recovery rates. For both assumptions, we start with longer-term averages and then incorporate qualitative views of default and recovery rates based on current ratings and sector mix.

We use this to calculate an expected loss at an index level, on average, each year over the whole LTCMA horizon. We deduct the expected loss from the projected total return to give the full final return assumption.

Currency exchange rate assumptions methodology

Our methodology for determining fair value exchange rates incorporates a quantitative approach, projects forward fair values over the LTCMA time horizon and incorporates key economic indicators, including GDP growth and inflation.

Normalization and sensitivity

The key sensitivity issues underlying our currency assumptions modeling are twofold: Relative to our macro forecasts, how much hotter will a given economy's trend rate of inflation and real GDP growth run, and for how long?

Mechanically, a 1% increase in a developed economy's equilibrium rate of inflation (absent an increase in another economy's inflation rate) implies about a 1% currency depreciation per year over our forecast horizon. This concept also holds true in emerging markets, where we note the following: 1% of real GDP growth per unit of labor by a single emerging market (EM) economy implies about 0.5% of additional currency appreciation per year.

Purchasing power parity

A purchasing power parity (PPP) framework, which assumes that price discrepancies between goods and services should drive changes in FX rates, continues to be the basis of our approach to determining the present-day fair value of exchange rates (**Exhibit 3**).

PPP itself is a simple enough concept, but national statistical agencies use different methodologies when measuring price levels, which introduced some complexity when we initially set out to use different countries' data series.

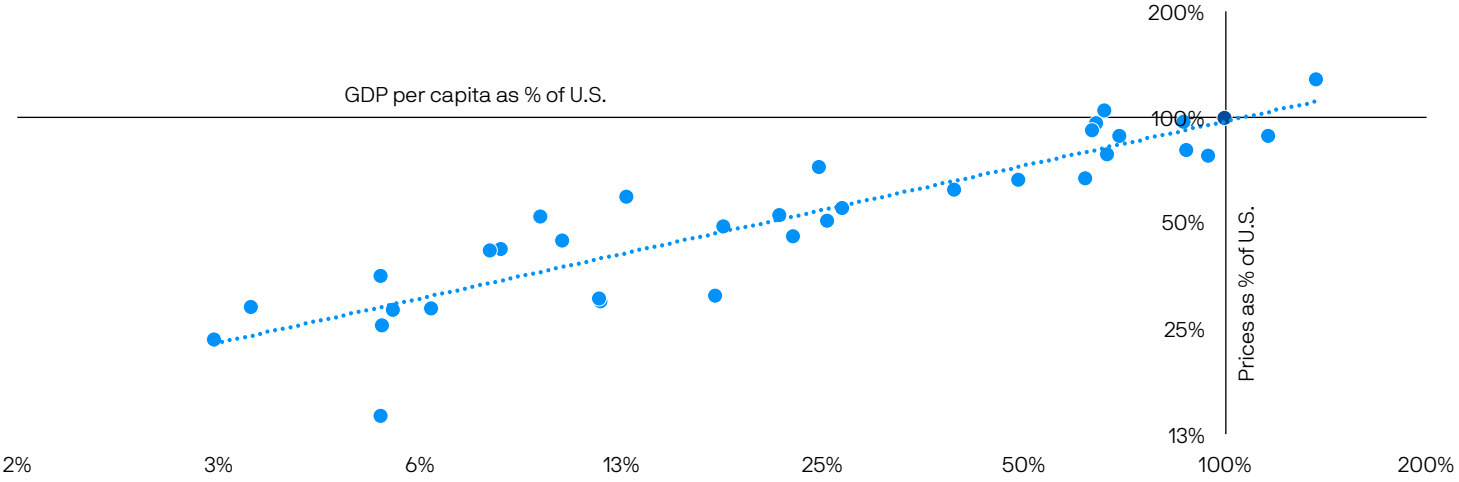
Leveraging the results of a recent proprietary research project, we now use a proprietary method in our calculations of present-day fair value.

Steps to building our quantitative FX fair values:

1. Obtain GDP per capita for each country in the local currency (CCY); convert to USD at the prevailing exchange rate; normalize by dividing by U.S. GDP per capita.
2. Obtain normalized price levels for each country by dividing the CCY/USD exchange rate by the PPP CCY/USD exchange rate. The normalization by U.S. values is not compulsory and in no way makes the output USD-based, but it helps keep outputs comparable through time.
3. Regress cross-sectionally the log of normalized price levels vs. the log of normalized GDP per capita, including a constant in the regression, and obtain residuals for each currency.
4. Repeat the above process for every day in the history to obtain a time series of residuals for each currency (**Exhibits 4A** and **4B**).

A PPP framework is the basis of our approach to determining present-day fair value exchange rates

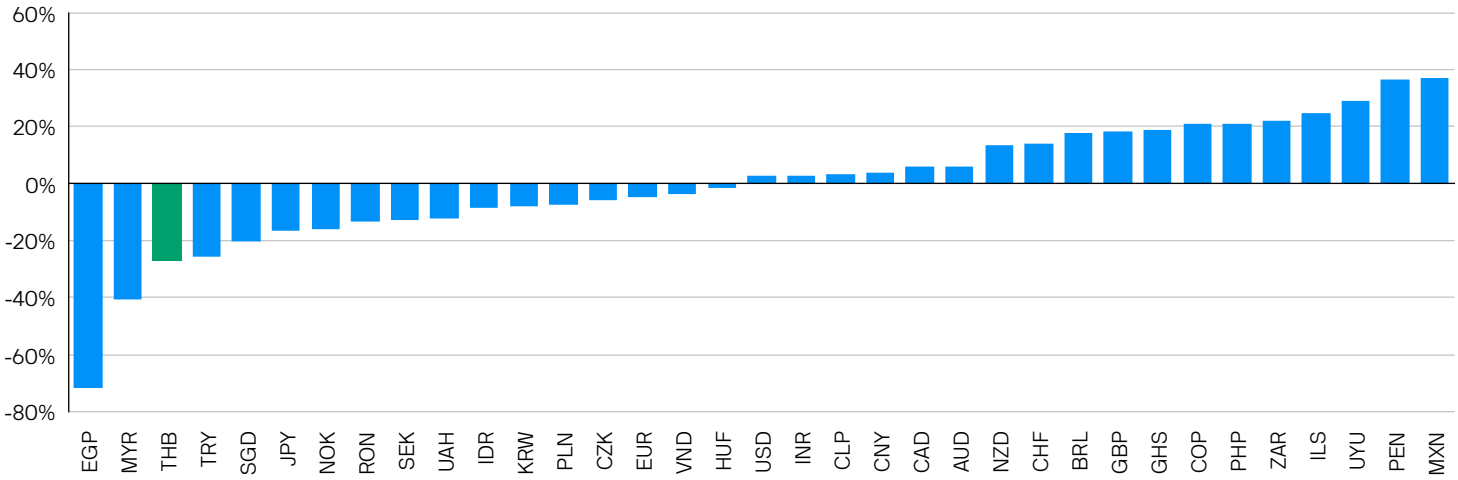
Exhibit 3: Absolute PPP valuation regression



Source: J.P. Morgan Asset Management; data as of July 2024.

Our proprietary FX valuation model in practice

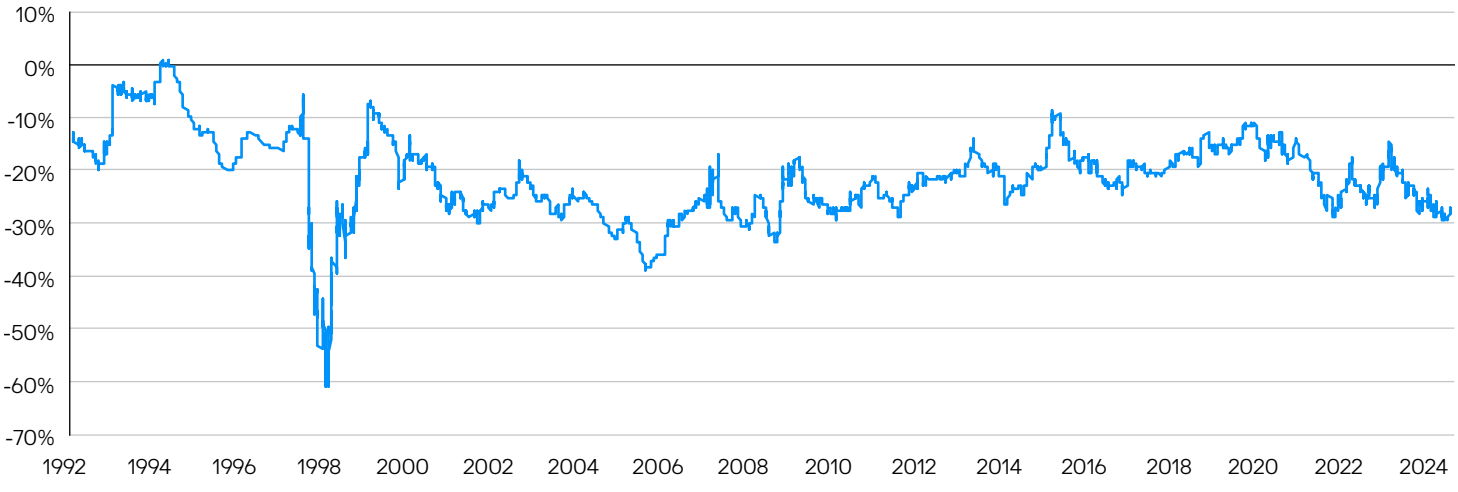
Exhibit 4A: Global FX valuation residuals



Source: J.P. Morgan Asset Management; data as of July 2024.

EGP: Egyptian pound; MYR: Malaysian ringgit; THB: Thai baht; TRY: Turkish lira; SGD: Singapore dollar; JPY: Japanese yen; NOK: Norwegian krone; RON: Romanian leu; SEK: Swedish krona; UAH: Ukrainian hryvnia; IDR: Indonesian rupiah; KRW: South Korean won; PLN: Polish złoty; CZK: Czech koruna; EUR: euro; VND: Vietnamese dong; HUF: Hungarian forint; USD: U.S. dollar; INR: Indian rupee; CLP: Chilean peso; CNY: Chinese yuan; CAD: Canadian dollar; AUD: Australian dollar; NZD: New Zealand dollar; CHF: Swiss franc; BRL: Brazilian real; GBP: UK pound; GHS: Ghanaian cedi; COP: Colombian peso; PHP: Philippine peso; ZAR: South African rand; ILS: Israeli new shekel; UYU: Uruguayan peso; PEN: Peruvian sol; MXN: Mexican peso.

Exhibit 4B: Thai baht (THB) residuals time series



Source: J.P. Morgan Asset Management; data as of July 2024.

5. For each currency, normalize the latest residual by the average residual in the history to account for country-specific structural factors that lead to an overvaluation (or undervaluation) of that currency vs. the broad universe of currencies.
6. Compare the overvaluation (or undervaluation) of each currency with the overvaluation (or undervaluation) obtained for USD to determine a USD-based misvaluation for each currency.
7. Obtain current fair value for each USD-based pair by comparing the current exchange rate with the computed misvaluation for that pair.

For projecting fair values forward 10 to 15 years, the LTCMA time horizon, we assume that the coefficient in the above regression would average around 0.5 over time; that is, every 1% outperformance in GDP growth per unit of labor input vs. the U.S. would raise the fair value, relative to PPP against the USD, by 0.5%.

The PPP fair value would also move by relative inflation differentials through time, with a -1 coefficient, so for every 1% increase in consumer price index (CPI) inflation vs. the U.S., PPP value would weaken by 1%. We then use the LTCMA GDP growth per unit of labor input, and the inflation projections, to make this adjustment.

For example, if a currency appeared to be 5% undervalued vs. USD currently (FX rate at 95% of fair value) but our assumptions expected a cumulative 10% growth in GDP per unit of labor input vs. the U.S. over our forecast horizon and a cumulative 3% greater inflation vs. the U.S., then our fair value at the end of the forecast horizon would need to be adjusted by

(1.1^0.5)/(1.03) = 1.018

making the current exchange rate 0.95/1.018 = 0.933 of the future fair value – and implying a 6.7% undervaluation at the end of our forecast horizon, relative to today's exchange rate.

In this example, the outperformance, in terms of that economy's growth, would be more than enough to offset the future weaker PPP exchange rate that would result from that economy's higher inflation forecast, making the upward valuation adjustment greater than what is currently needed.

Of course, the final step would be the qualitative adjustment to fair value, taking into account all the other variables that might influence the exchange rate.

Equity assumptions methodology

Our methodology for long-term equity market return assumptions integrates macroeconomic conditions, bottom-up equities analysis and a normalization process to project cycle-neutral targets. We also leverage our Global Equities team's insights into more than 3,000 companies. Together, these elements help us produce transparent, robust forecasts adaptable to various market conditions.

Our approach is not a dividend discount model. Several principles inform our equity assumptions forecasting:

Macro matters

Stocks do not perfectly mirror the economies in which they are listed. Still, we believe that macroeconomic conditions, especially nominal GDP and interest rates, impact equity returns.

Our forecasts are created in partnership with members of our Global Equities team, who conduct bottom-up analyses of more than 3,000 companies. This input provides a real-time assessment of corporate metrics including earnings, margins, shareholder returns and valuations, which we aggregate into index-level metrics. We rely more heavily on this input at the start of our forecast horizon, which aligns with our analysts' typical three- to five-year forecast horizon.

Normalization

Central to our methodology is the concept of normalization – a stylized path followed by equity market metrics, such as profit margins, multiples and revenues, before they reach what is, in our assessment, a cycle-neutral target at the end of our 10- to 15-year forecast horizon. This approach allows us to break down our returns into "cyclical" returns, which are driven mainly by assumptions about the change in valuations and margins, and "cycle-neutral" returns, which remove those components.

Building blocks, not black boxes

We use a building block approach that breaks down equity returns into more easily forecastable drivers (**Exhibit 5**). This approach has several benefits. It allows us to better assess how our forecasts are developing over time. It lets us isolate what our forecasts imply for other corporate metrics, such as return on equity (ROE) and equity risk premia. And in forgoing a dividend discount-style model, we avoid having too much sensitivity to interest rate inputs.

Our building block methodology breaks equity returns into their drivers

Exhibit 5: LTCMA equity assumptions building blocks

Component	Subcomponents		Outputs			LTCMAs
Revenue growth		Domestic growth assumption	Earnings growth	EPS growth	Price return	Total return
		International contribution to revenues				
		Sales % GDP				
Margins		Change from today's margin to total margin				
Net dilution		Buybacks				
		Gross dilution (issuance)				
Valuations		Change from P/E today to target P/E				
Dividend yield		Dividend yield forecast				

Source: J.P. Morgan Asset Management.

Equity assumptions building blocks

To generate equity assumptions, we use the following:

Revenues

Revenues are a function of the nominal GDP environment in the regions where they are earned. For each index, we analyze the geographic distribution of revenue sources and adjust our calculations accordingly. Higher real GDP and inflation expectations support higher revenue growth in our equity model.

We then adjust for revenue's ability to grow faster than GDP. This is generally true because the economic activity of listed stocks tends to outpace growth in other parts of the economy. In particular cases, we consider the dependence of revenues on macro factors such as commodity prices. In others, we raise or lower our revenue growth forecasts consistent with the exposure of each market to our key LTCMA themes. In other markets, especially those with a less attractive inflation-growth mix, we may expect revenues to expand more slowly than the sales-weighted GDP footprint.

Margins

Margins are pro-cyclical and over the shorter term tend to be positively correlated with inflation and growth. Over the longer term, our margin assumptions reflect our understanding of trends in the capital and labor shares of GDP, the changing sector composition of the stock market and our outlook for interest rates and taxes.

Net dilution

Net dilution, or changes in the share count, is dominated by issuance (including IPO activity) that increases the share count and buybacks that reduce it. Dilution is hard to forecast, and high quality data are hard to come by. We lean heavily on our equity analysts in each region to help forecast these components.

Valuations

A market with higher secular growth potential, a healthier capital structure and lower volatility of earnings will – all else equal – trade at a higher price-to-earnings (P/E) ratio than other markets. Shifts in an index's sector composition are also important to valuations.

Dividends

Dividends, like share buybacks, return capital to investors. The mix between dividends and buybacks is an important consideration for our equity returns. We look at historical precedent and make sure that payout ratios are consistent with appropriate ROE assumptions for each market.

Equity factor assumptions methodology

Our long-term equity factor assumptions forecast the performance of long-only factor indices. We cover five individual factor strategies: value, quality, momentum, minimum volatility and dividend yield, and multi-factor strategies in four geographies (U.S., global developed, international developed and emerging markets).

We use two index suites designed by J.P. Morgan Asset Management and calculated by FTSE Russell:

1. The J.P. Morgan US Single Factor Suite describes the performance of large U.S. companies chosen to target a single factor or characteristic.
2. The J.P. Morgan Diversified Factor Suite describes the performance of stocks chosen for their characteristics across multiple factors.

While there is no unambiguous, natural choice of index to represent long-only strategies in these spaces, we hope that these assumptions will help inform how investors think about asset allocation with respect to factors.

Our long-only factor indices are sector-matched to their benchmark at the GICS Level One basis.[5] For the diversified factor indices, sector allocations are equal risk-weighted at the sector level and therefore differ from market cap-weighted comparators.

[5] The Global Industry Classification Standard (GICS) is a widely accepted framework defining industrial sectors, groups and subsectors. Level one is the topmost classification.

How we forecast equity factor returns

A long-only factor strategy return assumption is made up of three parts:

- **A return contribution from equity market exposure:** This component captures the market risk of a long-only factor index. Our LTCMA equity forecasts are used as an input. We consider the beta of each factor index to its broader market and multiply it by the expected return to produce a market return contribution.
- **A cycle-neutral return contribution from the factor:** To estimate the long-term return from a given factor, we start with the factor's historical performance, comparing the best- and worst-performing stocks, ranked on each factor metric. Then, importantly, we measure each stock's performance relative to its sector and geographical peers, isolating the pure factor performance. Then we create a proxy portfolio in which we rebalance the quartile portfolios[6] monthly and incorporate conservative estimates for the cost of trading. We then apply a haircut to these returns to account for potential selection bias effects and market adaptation.
- **A measure of the factor's valuation:** Finally, we adjust for the current richness (or inexpensiveness) of factors, under the assumption that long-short factor returns are persistent but cyclical. Mechanically, we assume that the forward earnings yield differential between top-quartile stocks and bottom-quartile stocks will revert toward its long-term average over time, and adjust the factor return assumption accordingly.

  Importantly, this reversion in earnings yield moves toward – not to – the long-term average. Our methodology thus allows for elements of structural change within markets and, more specifically, within the components favored by a given factor.

Convertible bond assumptions methodology

Our long-term convertible bond assumptions forecast the performance of eight long-only convertible bond indices.

How do we forecast convertible bond returns?

Our forecasts incorporate LTCMA return estimates for equity and fixed income, along with the assumptions on convertibles' delta,[7] the underlying stock beta and credit quality. For global indices, we also estimate long-term regional allocations by incorporating trends in issuance into our forward-looking view. We analyze current and historical index data to derive these estimates.

Convertible bonds can be considered a combination of a straight fixed income bond and an equity option. Therefore, we decompose the convertibles' local return assumptions into two parts and estimate them in the following way:

1. A fixed income returns component

We estimate the long-term high yield and investment grade allocation for each index and apply the corresponding LTCMA high yield and investment grade return assumptions for each region.

2. An equity option returns component

Equity returns: We estimate the delta of each region as well as the underlying stock beta. This component reflects the potential upside the convertible bond can capture from equity market performance. It is calculated as:

*Regional delta * beta * LTCMA regional equity return assumptions*

- **Time decay effect:** Time decay is the reduction in the value of an option as time passes. At-the-money options experience the most time decay, as there is balanced uncertainty about whether the option will end up profitable by its expiration. This effect is deducted from the equity returns component.
- **Financing cost:** We estimate this using LTCMA cash return assumptions. Financing cost is deducted from the equity returns component.

[6] The quartile portfolios will be the result of the stock rankings on the factor metric, so top quartile is the portfolio of best-ranked stocks.
[7] Delta is the change in the option premium due to the change in the price of the underlying asset.

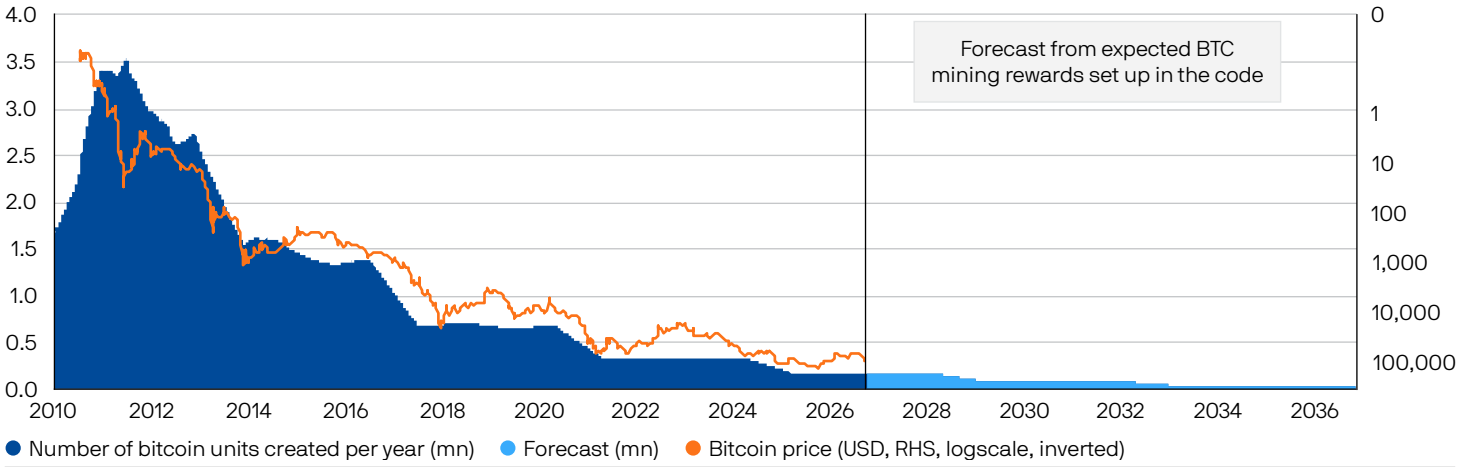
Bitcoin assumptions methodology

Few analysts attempt to formulate a 10-year forecast for bitcoin (BTC) because the crypto asset has only a short history of useful data to model, regulation is still evolving, and institutional products have been widely available for only a few years. Our forecasts use the most stable and intuitive relationships to provide guidance on return targets – giving those relationships the highest weight – and then apply a qualitative assessment of future catalysts that may occur as the crypto industry grows. (Some of these catalysts we detail here.)

Our base case for potential 10-year returns assumes that the relationship between the U.S. dollar price of BTC (log scale) and the pace of new BTC creation (supply) continues to hold – notably, that the latter remains well defined in the future (**Exhibit 6A**). To date, BTC has loosely followed four-year cycles, as its price growth has tracked the growth of the global money supply. This pattern, which began in early 2013, continued up until the start of 2025 (**Exhibit 6B**). While we have observed a small deviation in recent quarters as investors have used the growing money supply to buy gold, we believe the prior relationship will likely hold over the long term.

To date, bitcoin's U.S. dollar price has tracked the growth of new bitcoin supply, and we expect that to continue

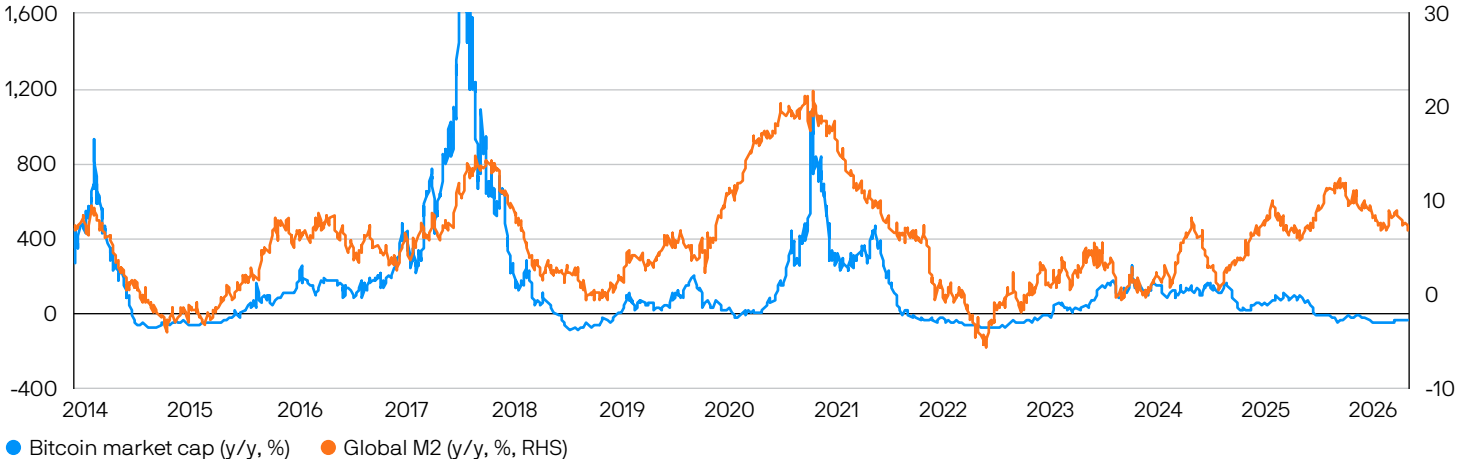
Exhibit 6A: Annual growth of new bitcoin units in circulation (to 2036) vs. the price of bitcoin



Source: Bitcoin Visuals; J.P. Morgan Asset Management; data as of September 30, 2026.

The growth of fiat global M2 money supply has been a large driver of price movements in bitcoin

Exhibit 6B: Annual growth of bitcoin's market capitalization vs. annual growth of global M2 money supply



Source: Bloomberg Finance L.P., J.P. Morgan Asset Management; data as of September 30, 2026.

What could this mean for bitcoin's price? Based on recent business cycles, the U.S. and global economy could very likely experience a downturn at some point in the next 10 years. The Federal Reserve's balance sheet has doubled several times since the 1990s, and while it is not easy to predict when the next large monetary expansion will occur, we assume that it might be most likely during an economic downturn sometime in the coming decade. This, we believe, is when the BTC price could rise materially.

In response, our bear and bull market cases for potential 10-year returns assume that fiat currency growth either slows or expands substantially. Our base and bull cases also assume crypto regulation develops to allow more traditional financial transactions to move onto blockchains. Some investors may buy BTC as a play on this broader crypto industry growth, but that trade would not, in our view, reap much benefit; the trading of the newly created tokenized assets (e.g., bonds, commodities and stocks) would occur on blockchains other than bitcoin, and BTC (the cryptocurrency) isn't required to settle those transactions.

We also considered a potential second driver: using BTC as a complement to gold in portfolios. While we don't agree with classifying bitcoin as "digital gold," we understand that many investors do. The price of both gold and bitcoin may be influenced by a similar set of external monetary drivers, many of which are correlated, making it difficult to separate each driver's unique impact on BTC's price.

What is easier to model is the potential for an influential large investor to allocate more to BTC than to gold or other value stores. Accordingly, our base case for this second factor is the same as the first: We assume some periods of investor rotation from gold into bitcoin based on respective price momentum and more defined crypto regulation. The bull case assumes that one large central bank in the top 20 (by size of reserves) would add BTC to its reserves – a move that some smaller central banks would likely follow. (However, we think it unlikely that a developed market central bank would take that step, because it would add a competitor to its own fiat currency model.)

We also considered a third driver: the value of the growth of the blockchain (an approach that was popular around eight to 10 years ago). However, since its peak in 2021, the number of active wallet addresses has halved – despite BTC's rising price – so forecasting the price of BTC based on the usage of the bitcoin blockchain (active users, transaction volumes, product growth, etc.) isn't a particularly useful approach. Accordingly, we give this third price driver a very small weight.

BTC blockchain activity may also stay low as bitcoin trading activity has begun to move to exchange-traded funds (ETFs) these trades don't necessarily require a transaction on the blockchain. While we would have preferred to include an estimate of BTC's future value based on ETF growth or the growth of traditional financial products on a blockchain, we simply don't have enough trading history yet to provide a useful guide. We may look to add this in future updates, however.

The introduction of ETFs and increasing dominance of institutional over retail trades have catalyzed another notable change: Bitcoin market volatility has been falling over the past five years. Our forecasts assume that bitcoin's volatility remains around these lower levels and doesn't return to the high volatility last seen 10 years ago. Nonetheless, given the asset's still-elevated volatility profile and unstable correlation dynamics vs. established asset classes, we do not see a role for bitcoin as a portfolio diversifier at this time.

Chapter 3

Private market and alternative asset assumptions methodology

Our long-term forecasts for alternative asset classes fall into two sections:

- Real assets, including real estate, infrastructure, transport, timberland, real estate investment trusts (REITs), commercial mortgage loans and commodities
- Financial alternatives, including private equity, venture capital, direct lending and hedge funds

Overview

This year marks the beginning of a multi-year review of all our private market assumptions methodologies as we continue to refine our return forecasts and expand our coverage of alternative asset classes globally. In the course of the review process, the team plans to revisit assumptions in prior methodologies to ensure any changes align with our long-standing philosophy: balancing methodological consistency with incremental, market-leading improvements.

For our 2027 return assumptions, we have undertaken a comprehensive review of asset-specific methodologies for global real estate and private equity. This renewed focus has enabled us to build on the foundations established by previous iterations of the Long-Term Capital Market Assumptions (LTCMAs) while also taking advantage of improvements in the quality, scope and consistency of available data.

Real asset assumptions methodology

Consistent with our approach in other asset classes, we use building blocks to construct our return assumptions for real assets. For the private real asset subcategories making up most of our universe, our approach remains broadly unchanged (**Exhibit 1**).

Our building block approach to constructing real asset return assumptions

Exhibit 1: Real asset assumptions building blocks

Core real asset returns		
=	Income return	This represents the path of expected income returns over the forecast period
-	Maintenance capex	A standard percentage of the total return, adjusted for factors like ESG or capex-related considerations
+	Net cash flow growth	Reflects the impact of long-term average growth on capital values, typically linked to GDP, inflation and underlying market dynamics (e.g., supply and lease structures)
+	Exit yield adjustment	Captures the impact on asset valuation at the end of the forecast horizon
+	Leverage	Describes the standard leverage profile typical for the asset class
-	Fees	Represents the typical fees associated with the asset class

Source: J.P. Morgan Asset Management.

Global real estate

For our 2027 forecast of long-term private real estate equity returns, we have rebuilt our assumptions using a single global framework based on MSCI data. The building blocks investors know from prior editions (income, cash flow growth, pricing, leverage and fees) remain the core drivers of our modeling approach. What has changed is how they are estimated: once, globally, with the same definitions and transmission logic in every market, and with local insight expressed through explicit, visible adjustments.

Our updated approach

Real estate total returns come from three sources: the income a property generates, the change in what buyers will pay for that income, and the structure used by investors to access the asset class. At the outset, our framework forecasts rents, then yields, using linked models grounded in clear and time-tested economic and financial concepts. These projections are then combined into total returns, with a small set of transparent overlays. Here, we detail each element in turn:

Rental growth: We build nominal rent growth as real rent growth plus inflation, making the inflation pass-through transparent. Real rents in turn follow real GDP (albeit not one to one). Real estate responds to the economy with a lag, as leases roll over only periodically. New supply also arrives slowly, and each market has its own supply-side and lease structures. Our model combines a common long-run anchor that links rents to GDP across markets, a short-run adjustment that describes how quickly rents converge toward that anchor, and explicit local overlays for regions where market-specific dynamics warrant them. The impact of supply-side variables (e.g., vacancy and development activity) is implied through estimated historical elasticities (adjusted to reflect the anticipated market environment). The output is a consistently derived expected path for long-run rental growth that reflects the idiosyncratic economic and market conditions in each of the 30 markets we cover.[8]

Yields: A property's yield is built much like a bond's: benchmark interest rates plus a spread for the risks of owning real estate less the expected growth from rents. Thus, yield always reflects rates vs. risk vs. growth. Two disciplines follow. First, the growth expectations inside our yield model are derived from our own rental growth forecasts, so expected yields and rents are aligned. Second, the risk environment enters through an explicit yield-spread concept that drives spread behavior in a controlled way. We handle local market characteristics (the speed of repricing, minimum premium floors) through explicit constraints rather than hidden coefficient tweaks, and when a constraint binds, its impact is recorded in a separate attribution bucket. By taking this approach, we can always say what came from the model and what came from governance.

Total returns: We do not run a separate return forecast; we calculate total returns mechanically from the rental path and the yield path. Income is the carry earned on the yield, and capital growth reflects cash flow growth and yield moves. Returns change because cash flows change and/or pricing changes – and, because the calculation is an identity rather than a regression, every driver of every forecast can be decomposed.

[8] Forecasting stays inside the MSCI universe: Rental and income growth are modeled in net-of-depreciation terms, inferred from MSCI-consistent yield and value dynamics rather than external rent or depreciation inputs. A small number of markets are excluded from the final forecast set to reflect gaps in the wider dataset.

Four overlays translate market-level core returns into the net, leveraged returns that investors may experience:

1. **Value-added:** Most core real estate funds carry an exposure of roughly 10% to development or higher risk assets, which we allow for mechanically. We also forecast dedicated value-add real estate strategies. Instead of building a separate model for higher risk real estate, however, we assume that its long-run returns are proportionate to the additional risk taken. We scale the core Sharpe ratio – allowing a modest dilution as risk rises – and apply it to value-add volatility. Three parameters do all the work: the core return and its volatility, the value-add volatility and the fraction of the Sharpe ratio retained.
2. **Leverage:** Borrowing costs are sourced from the LTCMA fixed income and corporate debt assumptions. The calculations assume variable rate debt and fixed loan-to-value levels.
3. **Fees:** A fixed adjustment that reflects typical institutional fee loads.
4. **Currency:** Translation into reporting currency uses the LTCMA FX assumptions.

The result is a consistent global structure in which, for example, raising our UK inflation assumption flows visibly through UK rents (the income element) and UK yields (part of the capital appreciation element) into every downstream building block for UK total returns.

We develop forecasts at the all-sector market level (e.g., the overall UK market, aggregating all sectors); we compute regional aggregates in common currencies, assuming fixed weights from 4Q 2025. As such, the regional and global aggregates don't reflect the impact of potential changes in the composition of the global real estate universe.

Comparability by construction

Applying exactly the same structure to every real estate market makes the assumptions comparable; the same filters apply to every country. When two markets' forecasts differ, that difference now more closely reflects the markets' economics (their growth, inflation, rate and risk assumptions); it is no longer an artifact of different models or data.

Fundamental, bottom-up insight from our investment teams still matters, however, and we incorporate it through explicit cash flow and exit yield channels – structurally recognizing that some market changes take longer than fundamentals alone might suggest. Any such adjustment is based on how we think fundamentals are likely to drive pricing, and we flag the adjustment's contribution so that it remains measurable.

Global infrastructure, transportation and timberland

For global infrastructure, we focus on core private infrastructure investments, particularly utility-regulated, contracted power and GDP-sensitive assets located in OECD countries. These exposures provide stable cash flows while maintaining sensitivity to long-term economic growth. Our return, volatility and covariance forecasts reflect our important focus on core infrastructure. As with our real estate projections, value-add infrastructure strategies would be expected to deliver higher returns, offset by increased volatility and enhanced equity correlation.

The infrastructure forecast uses the same building block framework as other real assets, combining starting yield, cash flow growth, valuation change and financing effects. This creates a transparent link between macroeconomic assumptions and expected returns while ensuring consistency and comparability across infrastructure, real estate and other real asset forecasts.

For transportation, we target core assets supported by strong counterparties, with particular emphasis on the maritime, energy logistics and aircraft sectors. These assets play a critical role in facilitating global trade and supply chain connectivity. As with both real estate and infrastructure, our focus on core transportation assets offering strong, high quality income returns shapes our volatility and covariance assumptions as well as our return projections.

The transportation forecast uses comparable building blocks to other real assets – income return, capital appreciation and financing structure – and applies them to representative shipping and aircraft assets. For these, we draw on both proprietary and high quality third-party data. These sector-level returns feed into an allocation mix – 59% maritime, 17% energy logistics, 22% aircraft and 2% rail – that produces a consistent strategic projection for market-level returns rather than individual asset outcomes.

For timberland, our assumptions provide global exposure across major institutional markets, including the U.S., Australia and New Zealand. This asset class emphasizes sustainable resource management alongside long-term value creation. As with the other real assets, our projections reflect higher quality core assets with a focus on income returns complemented by capital appreciation. While higher return strategies are available, they are not reflected in our calculations.

The timberland model follows the same framework as the other real asset models, with expected returns driven by income, cash flow growth and valuation changes. As with transportation, we base our calculations on a combination of proprietary and high quality third-party data. We derive long-term growth assumptions from our LTCMA macroeconomic outlook, while valuation adjustments reflect current market pricing, providing a consistent and economically grounded approach across real assets.

Other real assets

In addition, we adjust our building blocks to capture the unique nature and distinct return drivers of REITs, commercial mortgage loans (CMLs) and commodities. For all three asset classes, our return assumptions are structurally linked to the relevant underlying asset class and reflect our broader financial and economic assumptions. This linkage lets us attribute differences between return projections for "base" and "derivative" asset classes. For subcategories in which listed equivalents exist, such as REITs, we anchor on private market assumptions but also take into account differences in sector composition, leverage and amortization to net asset values.

We derive our commercial mortgage loan return assumptions from a mix of fixed and floating loans, beginning with yield assumptions that combine the base rate and spread. We then consider the effects of price action, prepayment performance and credit losses. Finally, we subtract fees to arrive at the total return.

Commodities

For commodities, our model begins with a cash return assumption, then adds a premium (or discount) based on current commodity-cycle positioning and expected price trajectories. We make further adjustments related to per capita consumption patterns in emerging markets and incorporate the anticipated decline in the trade-weighted USD. We then layer in relative impacts to supply and demand stemming from physical climate risks and electrification (**Exhibit 2**). The 2027 commodity projections exclude execution/management fees; this approach is consistent with projections that are intended to reflect the expected performance of a passive benchmark.

Components of our projections for commodities

Exhibit 2: Commodities return assumptions building blocks

Commodities return methodology	Details
Collateral return*	LTCMA for U.S. cash
Commodity-cycle positioning (+premium/-discount)	Based on traditional cycle dynamics, where we are in the current commodity cycle and projections of the next
Emerging markets per capita consumption adjustment	Expected impact from increasing emerging market demand catalyzed by strong projected economic growth
Trade-weighted USD decline impact	Projected incremental annual decline for the U.S. dollar to capture the historical inverse relationship relative to commodity returns
Electrification/climate risk adjustment	Incremental return coming from supply-demand imbalances driven by increasing electrification as well as physical risks under climate scenarios
Broad commodities return, gross of fees	The 2027 commodity projections do not account for execution/ management fees consistent with a passive benchmark

Source: J.P. Morgan Asset Management.

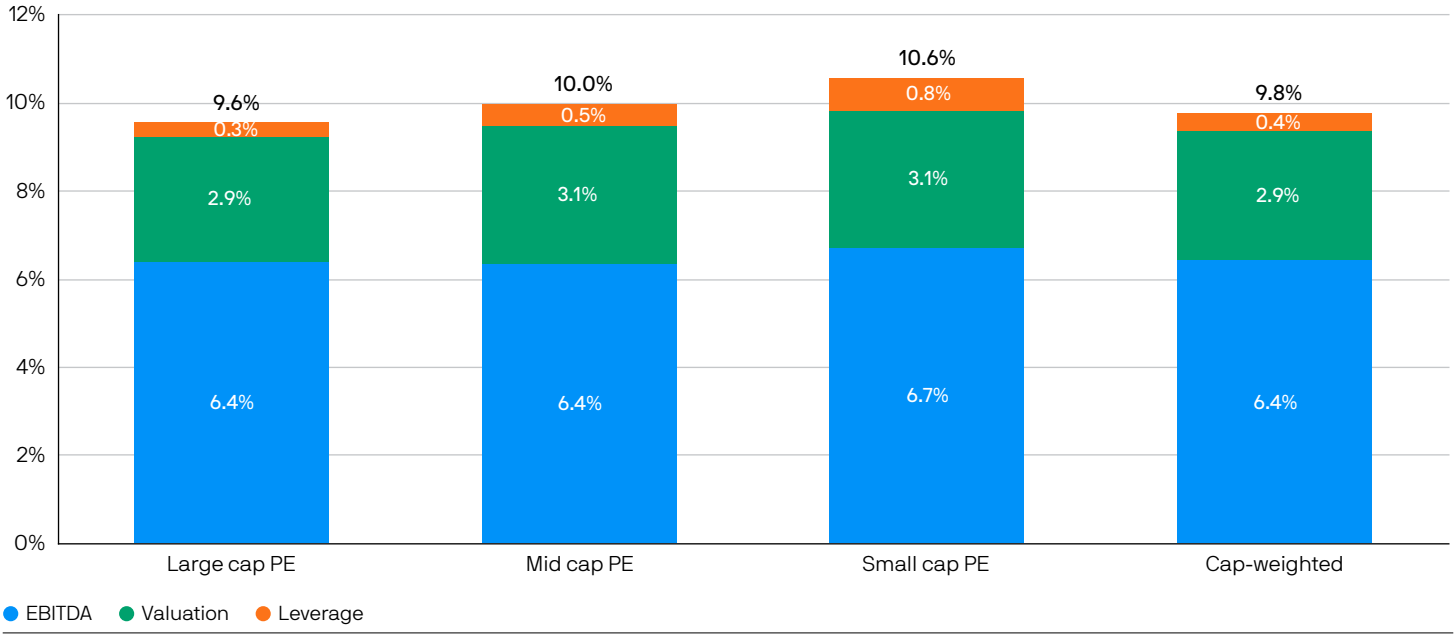
Financial alternatives assumptions methodology

Private equity

This year, we make a change in our approach to forecasting private equity (PE) buyout returns. Previously, we applied a beta to our midcap U.S. equity return assumption and then added on distinct estimates of the leverage impact and potential alpha generation over the forecast horizon. This year, applying enhanced methodology, we base our core buyout return projections on a value creation bridge: This approach models expected returns as a function of revenue growth, EBITDA margin, valuation (enterprise value/EBITDA) and leverage (**Exhibit 3**).

This year, we apply enhanced methodology to forecasting private equity's long-term return assumptions

Exhibit 3: Private equity return assumptions building blocks



Source: J.P. Morgan Asset Management; data as of September 30, 2026.

The inputs used to estimate these variables almost all tie back to the public market and macroeconomic forecasting process. Our forecast for public market revenue growth, for example, which ties back to our macroeconomic assumptions, is a direct input to the equation that forecasts private equity revenue growth.

Once we have a forecast for revenue growth, we apply the same methodology and leverage the public market margin forecast to inform our view on private equity EBITDA margins. We then take the same approach to forecasting valuation change, recognizing that valuation expansion is a known feature of private equity. Put differently, capital recycling would stall if sponsors could not sell portfolio companies at a premium to cost. By multiplying these three variables, we can calculate the expected growth in enterprise value and then apply leverage. (The cost of leverage is assumed to be a blend of our leveraged loan and direct lending forecasts.)

The geographic investment breakdown underpinning the public market exposure assumptions follows industry sources' intentions for investing dry powder. Smaller cap private equity funds are more biased toward the U.S., while larger cap segments include international markets, specifically Europe and Asia.

On alpha, we aim to forecast median manager performance. We link the public market expectations to our private market forecasts through a series of linear regressions; we view the intercepts as representing the "alpha," or outperformance, that managers have added over time. Empirically, this makes sense, as the sum of the intercepts is 2.5%–3%, a range that is in line with the historical premium private equity has provided relative to its public counterpart over the long term.

Venture capital

Venture capital (VC) is an asset class characterized by high volatility and the potential for outsize gains. Our approach combines bottom-up and top-down analyses, historical data, market conditions and the statistical relationship between venture capital and private equity returns.

We analyze historical data, noting that private equity has outperformed venture capital since the early 1980s due to VC's higher volatility. In an effort to capture the true trend in an idiosyncratic asset class, we take a statistical approach to generating our long-term return assumption, then take the median of these top-down and bottom-up estimates as the expected return.

For the first top-down model, we add the average historical spread between year-over-year (y/y) quarterly venture capital and private equity returns. Our second top-down approach uses the historical statistical relationship between quarterly venture capital and private equity returns on a y/y basis.

The bottom-up methodology uses a series of public market independent variables to predict venture capital returns, using two distinct models. Both models include small private equity buyout returns, the 10-year U.S. Treasury yield, U.S. real GDP growth, S&P 500 total returns and the relative performance of the Russell 2000 Index vs. the Russell 2000 Growth Index. One model then includes price-to-sales ratios of VC-backed IPOs, while the other includes the number of VC-backed IPOs.

Hedge funds

Our hedge fund return projections are based primarily on a multi-factor modeling framework that captures the most important systematic risks and performance generators for each hedge fund strategy class.

This approach uses regression analysis based on historical industry performance data to extract the beta, or public market drivers of return, from the alpha, or idiosyncratic skills-based return contributors. The hedge fund strategy composites (diversified and conservative) are then calculated as weighted sums of the four underlying strategies (equity long bias, event-driven, relative value and macro).

What our statistical analysis cannot identify as a market factor we describe as alpha, and every strategy's return projection is the sum of its beta and alpha components. We look to verify the alpha projection by overlaying the factor model's output with our qualitative insights, informed by various historical beta and alpha regimes.

We have enhanced our approach to projecting hedge fund returns in recent years by migrating from a long only-based regression model to a spread methodology that utilizes long-only and long-short data, or spread factors, to better capture the industry's investment dynamics over time. This enhanced approach provides greater explanatory power and better intuitive understanding of hedge funds' risk positioning while mitigating multi-collinearity issues. While the underlying methodology remains unchanged, this year the improved fit enhances the robustness of our results, with equity long bias and event-driven strategies showing R-squared values above 0.9 and relative value closer to 0.85.

Direct lending

We arrive at our long-term return estimate assumptions for direct lending by utilizing a number of components. Included in our process: our assumptions for U.S. cash returns; historical spread premiums derived from public indices; an overlay of recent deal activity and industry developments; long-term projections for default and recovery rates; and measures of leverage, financing costs and fees (**Exhibit 4**).

Understanding key factors for direct lending

Exhibit 4: Building blocks for direct lending return assumptions

USD, %	
Base rate (cash)	LTCMA assumption for cash
Weighted-average spread	Based on anticipated leveraged loan spreads, weighted for issuance quality and seniority, and additional return in the form of upfront fees and prepayment premiums
Credit costs	Assumed defaults, net of assumed recoveries
Loss-adjusted yield	**Cash + spread + credit costs**
Leverage	Reflects the turn of leverage added
Cost of financing	Estimated total cost of funding for an asset-based facility
Administration fees	Based on manager discussions of fund administration fees
Management and incentive fees	Based on manager discussions of management and performance fees on levered assets
Net levered return	**Sum of loss-adjusted yield + leverage + cost of financing + fees**

Source: J.P. Morgan Asset Management.

Chapter 4

Volatility and correlations assumptions methodology

Our methodology for forecasting long-term asset volatility and correlations involves leveraging historical data, adjusting for economic regimes and incorporating key structural changes. These steps provide us with a robust framework for understanding the risk dynamics of the asset classes and strategies in the Long-Term Capital Market Assumptions (LTCMA) universe.

Overview

Long-term asset volatility and correlations are the common starting point for our assumptions.

To calculate our assumptions, we use an expanding return data window with a fixed starting point of 2H 2006 and an end point at the close of the second quarter of the year of publication. We use monthly data for liquid assets and quarterly data for private assets,[9] and remove outliers that could bias our volatility estimates.[10] To align our forecasts with our forward-looking long-term view, we leverage historical return series but weight each data point by relevance, based on what we expect will be the frequency of various economic regimes.

Currently, as over the past few years, we have applied a long-run average probability of 15% to global periods of economic stress, reflecting our expectations of the likelihood that recession-like conditions will prevail sometime during the next 10 to 15 years. We also apply a probability to periods with higher bond risk and elevated inflation risk, which we set at 12.5% for the 2027 LTCMA edition to reflect the macro backdrop. Applying these probabilities mitigates the impact of a rolling data window on the forecasts and helps capture the core macro outlook in our risk assumptions.

Last, we incorporate key themes and structural changes that we expect over the forecast horizon, such as changes in credit ratings and maturities in asset classes, and reflect them in our long-term risk forecasts.[11]

Starting in the 2020 edition, we incorporated a statistical adjustment designed to ensure that our publicly released tables are numerically stable.[12] We had previously made similar adjustments internally. We are now making this positive semidefinite (PSD) adjusted output available broadly.

[9] We use the most recent data available at the time of forecasting for private assets. However, we obtain the quarterly data with a lag. As a result, for private assets we use data as of the end of the previous calendar year.
[10] For extreme data points above the 99.5% (or below the 0.5%) significance level of normal distribution, we adjust data by capping (or flooring) it at the 99.5% (or 0.5%) level.
[11] The approach we apply to our view of volatility and correlation is similar to that of many asset class returns in our incorporation of forward-looking views.
[12] Numerically stable calculations are those that can be proven not to magnify approximation errors.

Our process for estimating long-term volatility and correlations

Long-term asset class volatilities and correlations should exhibit stability when measured over multiple cycles. As such, we use the following process when estimating the long-term volatility and correlation assumptions:

1. For liquid assets with monthly data

We start with monthly historical return data

Our data window (as noted, with a fixed start at 2H 2006) is expanding. We filter extreme data outliers that could bias the volatility estimation by winsorizing[13] the historical raw data. For extreme data points above the 99.5% (or below 0.5%) significance level of normal distribution, or beyond a standard deviation of 2.58 from the mean, we adjust the return data by capping (or flooring) it at the 99.5% confidence (or 0.5% significance) level.

Construct an anchor matrix

We leverage historical experience to help anchor our forward-looking expectations, focusing on simple historical return series (with each data point equally weighted) and historical return series with each data point weighted by "relevance," based on the forward-looking frequency of the economic regime.

Define, weight and apply stress periods globally

We define stress periods based on National Bureau of Economic Research recessions, assign them a long-run average probability of 15% and apply these weights on a global basis. Although one could argue that the U.S. may not be the sole dominant economy in the future, in the historical sample period economic contractions in the U.S. affected global financial markets. Analysis based on a market definition of stress produces a similar outcome.

Stock-bond correlations tend to be higher during inflationary periods. With the rise of inflation risk and higher bond risk in recent years, we also assign a 12.5% probability to historical time periods when inflation was high.

Construct a variance-covariance matrix

Once we have adjusted for periods of stress and calm, we then calculate the variance-covariance matrix using the filtered dataset.

2. For alternative assets with quarterly data

Unsmooth quarterly series

For illiquid alternative asset classes/strategies that are hard to price, such as real estate, serial correlations can be prevalent. The difficulty in valuing the underlying assets at regular intervals is that fair prices are unobservable. Therefore, we require an investment manager to estimate them. This is typically done by updating lagged prices with changes in the economic environment. Using previous prices as an input for the estimation artificially smooths the returns. In our view, this biases risk estimates beneath the true economic risk.

We correct for this bias by adjusting the returns from these hard-to-price assets for first-order serial correlation. We estimate the serial correlation coefficient using the same data window as for the liquid assets, applied to the returns of these assets before calculating their anchoring volatility and correlations. This adjustment helps to determine the true risk between these assets and the full investment opportunity set, preventing the underestimation of overall portfolio risk.

AR(1) unsmoothing methodology – used for assets with quarterly returns:

Calculate autocorrelations between original quarterly series and 1-period lagged series:

$$\rho_1 = \frac{Cov(r_{t-1}, r_t)}{Var(r_{t-1})}$$

Remove autocorrelated portion from return t-1 in return t:

$$r_{t_{unsmoothed}} = (r_t - \rho_1 r_{t-1})/(1 - \rho_1)$$

Source: J.P. Morgan Asset Management.

[13] Winsorization applies a cap and a floor to extreme data values to remove the impact of potentially spurious outlier data on statistical results.

While hedge funds provide monthly data, we have chosen to unsmooth the historical data for hedge fund managers. This decision is informed by the observation that some fund managers exhibit serial correlation. Moreover, although hedge funds are not as illiquid as other alternative assets, they do possess some illiquidity characteristics, and unsmoothing can help uncover some of these underlying risks. To forecast the volatility of each hedge fund asset class for a representative holder, we conduct simulations to create combinations of equal-weighted managers for each hedge fund asset class. The simulation creates a hypothetical holder with less than 10 holdings per allocation. We then use the median volatility from these simulations as our volatility estimate for the asset class. This process helps us address both illiquidity and the overdiversified nature of broad hedge fund indices. The magnitude of the vol penalty is determined by in-house research, including simulation work performed by analysts (broadly, in the range of 1.0%–2.5% vol points).

3. To create the full matrix with all assets, construct a variance-covariance matrix

We construct the full variance-covariance matrix for both liquid and illiquid assets, using unsmoothed quarterly returns for illiquid assets and down-sampled quarterly returns for liquid assets, equal weighted. We then replace the subset covariance across liquid assets with a covariance matrix derived from our liquid asset methodology.

Adjust for key themes and structural changes

We reflect the key themes and structural changes expected over the forecast horizon in the long-term risk forecast. For example, we adjust for changes in credit ratings and maturities in fixed income assets and reflect them in our long-term risk forecasts. We also adjust alternative asset volatilities, as those assets' "true" volatility usually sits between "accounting vol" from smoothed return series and the "empirical vol" derived from unsmoothed series.

Adjust for autocorrelation in inflation series

We use seasonally adjusted monthly headline consumer price index (CPI) series across all countries included in the LTCMAs for inflation volatility forecasting. The inflation rate is calculated as the month-over-month change in the CPI. Autocorrelation presents in inflation time series, which is a function of the underlying economic process.

The most common approach to annualizing monthly volatility for financial assets, multiplying monthly volatility by √12, assumes the underlying data is independent and identically distributed (i.i.d.). [14] With positive autocorrelation in the underlying data, the annualization factor is greater than √12, and therefore the true annual volatility is higher.

We use the Newey-West estimator,[15] a robust historical long-run volatility estimator that captures the persistence in the monthly inflation rate, to address the autocorrelation in the inflation data. We prefer this tool because it can be applied directly to volatility estimation without altering or replacing the original data. In this instance, we use the same historical data window that we apply to other liquid assets, i.e., 2H 2006–1H 2026.

Ensure the covariance matrix has a stable numerical property – is symmetric and positive semidefinite

For a covariance matrix to be proper and used in optimizations, it needs to be symmetric and positive semidefinite. Due to inconsistency in underlying datasets' periodicity (e.g., monthly returns for liquid assets and quarterly returns for illiquid assets), a covariance matrix including both liquid and illiquid assets may not be guaranteed to be PSD.

We introduce a methodology by Nicholas Higham[16] to find the nearest symmetric PSD matrix norm to the original covariance matrix, computed from raw returns. We do this through an iterative bisection algorithm on the upper and lower bounds on the distance of the original matrix from the nearest PSD matrix.

Once we find the nearest matrix that is positive-definite, we then derive the volatilities and correlations from the PSD covariance matrix as the numbers included in the official assumptions.

[14] "Independent and identically distributed" (i.i.d.) data signifies that each observation is drawn from the same distribution and doesn't depend on any other observation. In the context of a time series, "i.i.d." implies no autocorrelation (past values don't help predict future values).

[15] Named for the economists Whitney K. Newey and Kenneth D. West, the Newey–West estimator is a heteroskedasticity and autocorrelation consistent (HAC) estimator of the variance of a sample mean (and, more generally, OLS coefficient covariance), replacing the i.i.d. variance with a long-run variance (LRV) that incorporates autocovariances. Whitney K. Newey and Kenneth D. West, "A Simple, Positive Semi-Definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix," *Econometrica, 55*, No. 3, May 1987, 703–08.

[16] Nicholas J. Higham, "Computing a nearest symmetric positive semidefinite matrix," *Linear Algebra and Its Applications 103*, 1988, 103–18.

Why are some of the asset volatilities, especially in alternative assets, higher than typically reported?

Here, we provide an example of how we approach this forecast for direct lending. The underlying data we use for direct lending is quarterly, which means the returns are smoothed. This matters because volatility calculated directly from quarterly time series is accounting volatility – the volatility computed by reported values – which is known to be lower than economic volatility. Economic volatility, which is what we forecast in the LTCMAs, is based on underlying risk and exposures. Essentially, it is our projection of the investments' underlying risk.

For direct lending specifically, leverage exists in the underlying assets, along with credit risk. Our forecasts in the LTCMAs capture the underlying credit/asset risk, leverage and illiquidity.

We forecast economic risks in the LTCMAs for most alternative assets. This means we leverage the reported data for analysis but do not simply calculate the standard deviation of the reported net asset value (NAV) as its risk (i.e., what we refer to as accounting vol), because accounting volatility would be incompatible with the rest of the LTCMA risk forecasts for public liquid assets. This in turn would hinder full portfolio construction exercises.

One might ask how we calculate economic vol, which is inherently unobservable. We attempt to reach a reasonable forecast balancing underlying beta risk and underlying economic risk, including the use of any leverage and the degree of such usage. This is further cross-checked for comparability with other broadly related asset classes and the forecasted Sharpe ratio.

Another lens we consider is a hypothetical exercise: If one needed immediate access to capital (for example, during a period of market stress), what would the possible discount to NAV be? For more mature asset classes that markets reprice with greater frequency, the difference is likely smaller, provided leverage is embedded into the reported NAV. For alternative assets, which are more opaque and not repriced regularly, the difference is likely on the larger side, given economic and accounting risks.

We acknowledge that investors experience accounting vol and receive it in their investment statements. However, we believe those measures are not suitable for portfolio construction.

A few things to keep in mind

First, the standard deviation calculation is not subject to sequence risk. Thus, our assigned aggregate weighting of stress periods and inflationary periods (15% and 12.5%, respectively) matters, but not the order of the data points or the continuity of these periods. Put differently, the percentage weighting matters, but not when a recession or high inflation scenario might happen in the cycle. Therefore, our forecast will not predict when these economic regimes may happen but is, rather, an outlook overall for their likelihood over the course of a full cycle.

Second, the weights are consistently applied to all the various currency matrices we publish. The forward-looking periods and the treatment of historical data are identical across regions and assets.

Third, the volatility estimates capture the likely movement of the return around our central return forecasts. However, they do not incorporate distribution elements, such as the tail risk of the assets and other upper moments. It is particularly important for investors that hold assets known to have "fat tails," i.e., assets whose return distributions are likely to be more extreme than a normal distribution would predict – such as high yield bonds, emerging market debt and convertible bonds – to account for such risks in addition to volatility.

Last but not least, the volatility and correlation forecasts are akin to expected long-run average experience. Under varying economic regimes, the variance-covariance matrix may clearly deviate from the long-run expectation.

Appendix

Frequently asked questions

How accurate have the Long-Term Capital Market Assumptions been historically?

Exhibit 1 provides the historical performance of our LTCMAs over a 15-year period, through September 2026. It shows that the LTCMAs have effectively predicted market outcomes and that actual market performance has been consistently within the forecasted range.

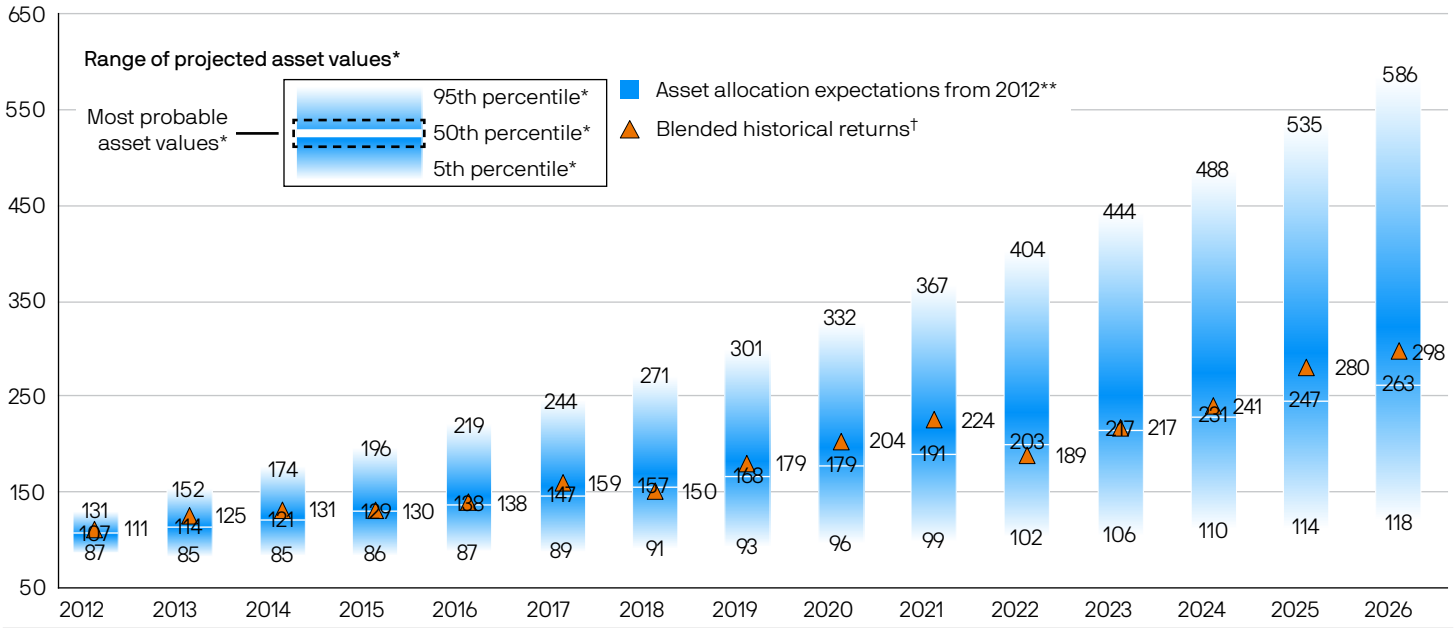
The blue bars represent the 2012 LTCMAs' projected range for a 60% stock-40% bond (60/40) asset allocation; the red triangles show actual performance.

The LTCMAs forecast both return and volatility. Despite significant economic events, actual performance aligned closely with predictions, staying near the median until a 2022 bear market moved it to the lower half. Clients are advised to focus on median wealth values and maintain their allocation during downturns to recover. The graph demonstrates consistent accuracy, instilling confidence in the use of the assumptions in models for investment planning.

Our numbers stand the test of time

Exhibit 1: A comparison of blended historical returns and our capital market assumptions

2012 LTCMA summary assumptions for a 60% ACWI, 40% US Agg allocation:
Long-term compound return = 6.7%, long-term volatility = 13.6% (initial value = USD 100mn, no taxes)



IMPORTANT: The projections or other information generated regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual or estimated investment vehicle results and are based on simulated results using 2012 LTCMAs. The results may vary with each use and over time. Furthermore, the material is incomplete without reference to, and should be viewed in conjunction with, the verbal briefing provided by a J.P. Morgan representative. Note: This is a past projection used for illustrative purposes only and does not represent investment in any particular vehicle. Past performance is no guarantee of future results. It is not possible to invest directly in an index.

* "Most probable asset values," denoted by the darkly shaded area, indicates the range in and around the 50th percentile. The "50th percentile" indicates the middle value of the entire range of probable asset values. The "95th percentile" value indicates that 95% of the probable asset values will be equal to or below that number; the "5th percentile" value indicates that 5% of the probable asset values will be equal to or below that number. Another way of looking at it that 90% of the probable asset values will be between those two figures.

** 2012 asset allocation expectations assume annual rebalancing, no taxes and no cash flows.

† Blended historical returns are calculated by assigning a relevant index to each asset class and blending the returns of those indices according to the asset allocation, which remains fixed for the entire period and assumes monthly rebalancing. Results do not reflect actual asset allocation or performance of any portfolio or account over this period. All returns are based on index data. Indices used: MSCI AC World Index, Bloomberg US Aggregate Bond Index.

What is the difference between arithmetic and geometric (compound) return?

The LTCMAs are published in both arithmetic and geometric terms. Arithmetic return and geometric return (also called compound return in our publications) are commonly used methods for calculating the return on a given investment.

The return that is most relevant to investors for a single asset is the geometric return, commonly referred to as the constant rate of return at which an investor can compound, for any period, to produce the same value that the actual variable returns produced.

Geometric return accounts for compounding and incorporates volatility. Arithmetic is additive – the result of summing. While geometric is always lower than arithmetic, the difference between them grows with higher volatility.

While geometric returns are used for single assets, when it comes to portfolio returns, arithmetic returns should be used instead. The long-term return of an allocation – for example, a 60/40 stock-bond portfolio – is the weighted average of the arithmetic return of each asset class. The same is not true for geometric returns. In short, the geometric return of an allocation is not the weighted average of the geometric returns of each asset class, because it accounts for the compounding effect and is not additive.

Using the 60/40 U.S. stock-bond portfolio as an example, in the 2027 edition of our LTCMAs we published **Exhibit 2** for U.S. aggregate bonds and the All Country World equity index:

A portfolio allocating 60% to All Country World equity and 40% to U.S. aggregate bonds would have the following estimated annual arithmetic return over the next 10 to 15 years:

Portfolio arithmetic return =
*60% * 8.94% + 40% * 5.70% = 7.64%*

If the investor preferred to view portfolio return in geometric form, the arithmetic portfolio could be converted back to geometric by removing the portfolio volatility (11.49%) using a mathematical formula. A commonly used approximation is:

Geometric return = Arithmetic return – 0.5 (volatility^2)*

Are the LTCMAs real or nominal?

The assumptions are nominal – inclusive of inflation.

What is the difference between the LTCMAs' forecasted returns and cycle-neutral returns?

Published returns in the LTCMAs represent J.P. Morgan Asset Management's forward-looking estimates for specific asset classes' average annual returns over the next 10–15 years. The return forecasts are informed by macro assumptions, asset-specific drivers and normalization effects.

A cycle-neutral return for a given asset class is the expected ongoing return after yields or valuations have normalized to their long-run average levels, excluding the temporary capital gain or loss from the normalization path, which is often referred to as "cyclical return."

In brief:
The LTCMA return = cycle-neutral return + cyclical return

Understanding geometric vs. arithmetic returns

Exhibit 2: Compound and arithmetic return, and annualized volatility

LTCMA 2025	Compound return	Arithmetic return	Annualized volatility
U.S. aggregate bonds	5.60%	5.70%	4.68%
All Country World equity	7.50%	8.94%	17.88%

Source: J.P. Morgan Asset Management; data as of September 30, 2026.

In building your LTCMAs, how do you come up with your composites?

To build composite forecasts, we cross-multiply each market's return by its weight in each index. For some indices, such as the MSCI Emerging Markets Index, we don't forecast every region in the index and thus reassign the weights of uncovered regions pro rata. For fixed income, we use the same methodology based on market cap.

What is the difference between direct (core) real estate and value-added real estate?

The distinction between direct, also called core, and value-added refers to the type of investment a fund makes. Core real estate is broadly diversified and involves less leverage. Core real estate's expected return and volatility generally fall within the range of fixed income and equity. Value-added real estate is a more opportunistic asset class in that it has more embedded

leverage, may be less diversified and comes with a higher expected return and volatility profile. In short, value-added is riskier than core.

What role does historical data play in developing the assumptions?

The LTCMA process is proprietary and distinctly different from many firms' outlooks that use long-term historical performance as their basis. Our process is a key investment differentiator vs. our competitors.

We use history as a guide to help analyze long-term levels, patterns and trends, but the LTCMAs are definitively forward-looking. The returns incorporate our strategic investment insight and judgment, and are not historical averages. In cases where we don't have representative historical index data, such as private equity, we use other approaches.

Additionally, the LTCMA leadership team and working group can override historical volatility estimates. For example, in the past, volatilities for credit-related asset classes were increased to reflect an expectation of higher risk going forward.

Furthermore, high return assumptions should not be considered a precursor of portfolio success; overestimating returns (in equity, for example) can lead to the misallocation of investment resources and poor absolute performance. The decade of the 2000s clearly indicates the pitfalls of relying on historical data (**Exhibit 3**).

Our forecasts don't rely on historical data

Exhibit 3: Asset class and 60/40 portfolio performance, 1970–99 and 2000–09

	1970–99 performance	2000–09 performance
U.S. stocks	13.7%	-1.0%
Commodities	2.2%	10.4%
U.S. bonds	9.0%	6.3%
Allocation of 60% stocks, 30% bonds, 10% commodities	11.6%	2.9%

Source: Bloomberg, Ibbotson, J.P. Morgan Asset Management; data as of December 31, 2009.

U.S. stocks are proxied by the S&P 500 TR Index. Commodities are proxied by the GSCI Spot Index. U.S. bonds are proxied by the Barclays Capital Aggregate Bond Index after January 1976 and the Ibbotson US IT Government Bond Index prior. Sample allocation assumes monthly rebalancing and no fees or taxes.

How do you handle FX in the LTCMAs?

FX is a key component in our LTCMA forecasting process and is embedded everywhere in our currency matrices. FX forecasts impact the forecasted asset returns, and historical FX movements are applied to the asset return time series used in our risk and correlation forecasts.

On the return side, we forecast local asset returns first, then add on the FX forecasts to get the unhedged return in reporting currency. For example, the 2027 LTCMA forecast for U.S. large cap equity returns is 7.5% in USD. To get its return in EUR, we need to subtract 0.5% of the euro's appreciation vs. the USD from our FX forecasts, which results in a lower unhedged EUR return of 7.0%.

For the hedged return, we use the forecasted cash return differentials as a proxy for future long-term hedging cost. Using U.S. large caps as an example again, our 2027 LTCMA cash return forecast is 3.2% for the U.S. and 2.6% for the eurozone. The difference, 0.6 percentage points, is the cost to hedge USD return into EUR. Therefore, the U.S. large cap hedged return in EUR is 6.9%.

On the risk side, our process is to use FX-adjusted historical return time series. Therefore, FX risks are reflected in the volatility and correlation numbers. To convert a local asset return series to reporting currency, we take the spot rates between the base and reporting currency and calculate the monthly currency return. For each month:

*Unhedged asset return in reporting currency = local asset return + currency return *(1+ local asset return)*

To hedge the asset returns, we utilize one-month FX forwards and calculate the forward return, or FX carry return, which is proportional to the short-term interest rate differential of the two currencies. It can be either positive or negative, depending on relative short-term rates. The forward return and the currency return to a large extent cancel each other out, and therefore the hedged return is close to the local return.

In equation form:

*Hedged asset return in reporting currency = local asset return + currency return *(1+ local asset return) + forward return*

Assuming efficient hedging, the hedged asset volatility should be very close to the local volatility.

What indices are you forecasting?

The indices are listed in **Exhibit 4.**

The indices forecasted in the LTCMAs

Exhibit 4: Indices by asset class

Public markets: Equity	Index
U.S. large cap	S&P 500 Total Return Index
U.S. mid cap	Russell Midcap Index Total Return
U.S. small cap	Russell 2000 Total Return Index
Euro area large cap	MSCI EMU Net Return EUR Index
Japanese equity	MSCI Japan Net Total Return Local Index
Hong Kong equity	MSCI Hong Kong Net Total Return USD Index
UK large cap	MSCI UK Net Total Return Local Index
EAFE equity	MSCI EAFE Net Total Return USD Index
Chinese domestic equity	CSI 300 Total Return Index
Emerging markets equity	MSCI Emerging Net Total Return USD Index
All Country Asia ex-Japan equity	MSCI AC Asia ex Japan Net Total Return USD Index
All Country World equity	MSCI ACWI Net Total Return USD Index
Global convertible bonds hedged	UBS Thomson Reuters Global Convertible Bond Index Hedged USD

Public markets: Factors	Index
U.S. equity value factor	JP Morgan US Value Factor Index Total Return Index
U.S. equity momentum factor	JP Morgan US Momentum Factor Index Total Return Index
U.S. equity quality factor	JP Morgan US Quality Factor Index Total Return Index
U.S. equity minimum volatility factor	JP Morgan US Minimum Volatility Index Total Return Index
U.S. equity dividend yield factor	JP Morgan US Dividend Index Total Return Index

Public markets: Fixed income	Index
U.S. inflation	US CPI Urban Consumers (seasonally adjusted)
U.S. cash	FTSE 3 Month Treasury Bill Local Currency
U.S. intermediate Treasuries	Bloomberg US Intermediate Treasury Total Return Index Value Unhedged USD
U.S. long Treasuries	Bloomberg US Long Treasury Total Return Index Value Unhedged
TIPS	Bloomberg US Treasury Inflation Notes Total Return Index Value Unhedged USD
U.S. aggregate bonds	Bloomberg US Agg Total Return Value Unhedged USD
U.S. securitized	Bloomberg U.S. Securitized: MBS/ABS/CMBS and Covered Total Return Index Value Unhedged
U.S. short-duration government/credit	Bloomberg 1-3 Yr US Gov/Credit Total Return Index Value Unhedged
U.S. long-duration government/credit	Bloomberg U.S. Long Government/Credit Unhedged USD
U.S. investment grade corporate bonds	Bloomberg US Corporate Total Return Value Unhedged USD
U.S. long corporate bonds	Bloomberg Long US Corporate Total Return Index Value Unhedged USD
U.S. high yield bonds	Bloomberg US High Yield 2% Issuer Cap Total Return Index Value Unhedged USD
U.S. leveraged loans	Credit Suisse Leveraged Loan Total Return
World government bonds hedged	FTSE WGBI Currency-Hedged USD
World government bonds	FTSE World Government Bond Index (WGBI) USD
World ex-U.S. government bonds hedged	FTSE Non-USD WGBI Currency-Hedged USD
World ex-U.S. government bonds	FTSE Non-USD WGBI USD
Emerging market sovereign debt	J.P. Morgan EMBI Global Diversified Composite
Emerging market local currency debt	J.P. Morgan GBI-EM Global Diversified Composite Unhedged USD
Emerging market corporate bonds	J.P. Morgan Corporate EMBI Broad Diversified Composite Index
U.S. muni 1–15 yr blend	Bloomberg Muni 1-15 Year Blend (1-17) Total Return Index
U.S. muni high yield	Bloomberg Muni High Yield Total Return Index Value Unhedged USD

Private markets: Real assets	Index
Global ex-U.S. REITs	FTSE EPRA/NAREIT Developed ex US REITs Index Total Return
U.S. REITs	FTSE NAREIT All Equity REITs Total Return Index
Global REITs	FTSE EPRA NAREIT Developed TR Index USD
Commodities	Bloomberg Commodity Index Total Return
Gold	Bloomberg Gold Total Return
Global core real estate	MSCI All Country Quarterly Property Index*
Americas core real estate	MSCI All Country Quarterly Property Index*
EMEA core real estate	MSCI All Country Quarterly Property Index*
Asia-Pacific core real estate	MSCI All Country Quarterly Property Index*
U.S. core real estate	MSCI USA Quarterly Property Index*
European core real estate	MSCI All Country Quarterly Property Index*
UK core real estate	MSCI GBR core real estate total return index*
Commercial mortgage loans	Commercial mortgage loans*
Global core infrastructure	Global infrastructure equity*
Global core transport	Global core transport*
Global timberland	Global timberland*

Private markets: Financial alternatives	Index
Private equity	Burgiss Private Equity All Capitalization TR Index
Venture capital	Burgiss Venture Capital All Capitalization TR Index
Diversified hedge funds	HFRI FOF Diversified Index
Event-driven hedge funds	HFRI Event-Driven Total Index
Long bias hedge funds	HFRI Equity Hedge Total Index
Relative value hedge funds	HFRI Relative Value Total Index
Macro hedge funds	HFRI Macro Total Index
Direct lending	Cliffwater Direct Lending Index – Total Return

* Proprietary aggregation methodology.

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