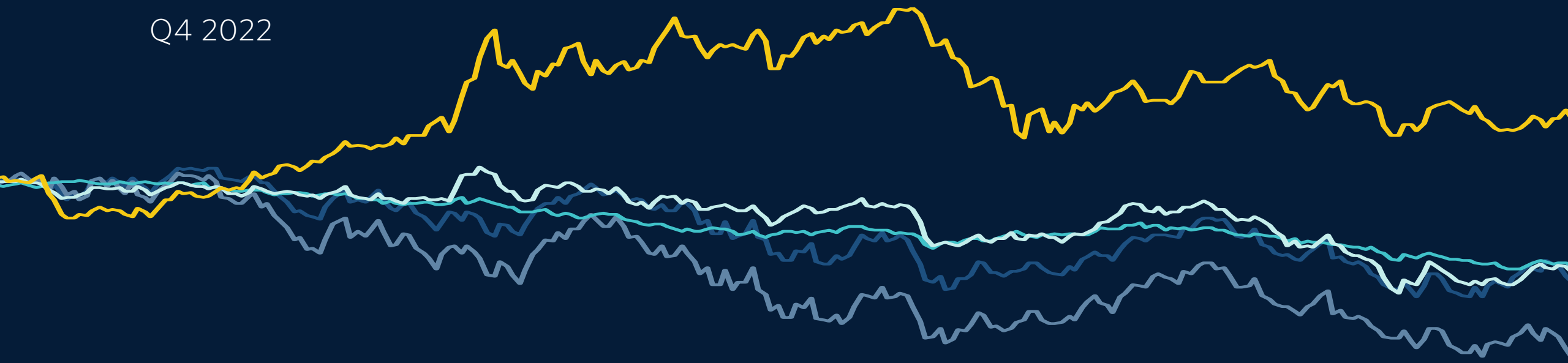
PitchBook

QUANTITATIVE PERSPECTIVES

When the Tide Goes Out

Q4 2022



When the Tide Goes Out

Introduction

A deteriorating macroeconomic and market environment, highlighted by slowing growth, a sharp increase in short-term interest rates, and tightening credit and liquidity conditions, will likely lead to a challenging period ahead for investors. The window for an economic soft landing following the monetary tightening cycle has narrowed further as high inflation has been more stubborn than many expected, leading the Federal Reserve (Fed) to be more aggressive with rate hikes relative to expectations earlier this year. While inflation has started to slow, its path back to the 2% target remains highly uncertain as does the Fed's willingness to accept anything significantly above that target. Relative to past economic downturns, above-target inflation will force the Fed to be more conservative this time with respect to supporting weak growth and financial markets.

In this report, we cover the key components of the difficult market landscape and how it might impact PE. While buyout dealmaking has held up thus far, high and rising debt costs combined with a continued pullback in financing availability will be a significant headwind moving forward. Additionally, with benchmark rates likely to move above 5% and an elevated probability of recession, we see the potential for significant credit distress in portfolio companies, particularly those that were acquired at elevated valuations in cyclical sectors.

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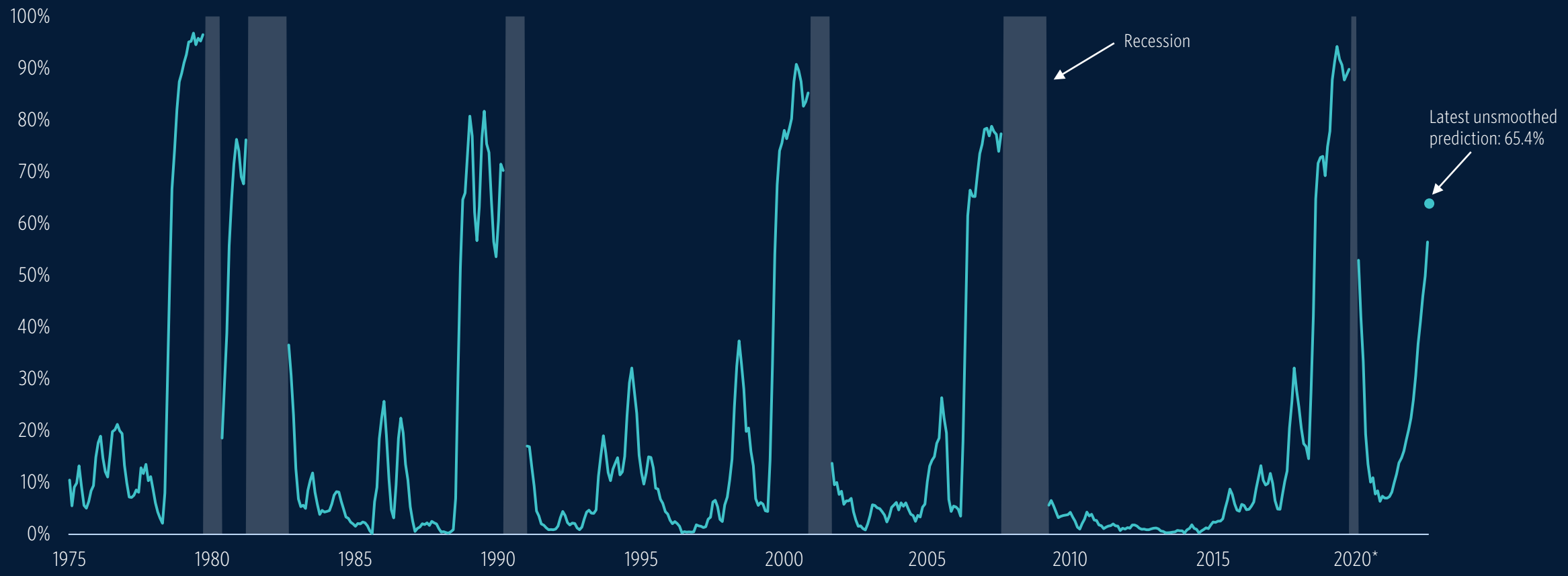
The economic outlook

Key takeaways

- The window for an economic soft landing following the end of the current monetary tightening cycle has narrowed. Our quantitative recession model predicts that recession odds have risen sharply in recent months, and one is likely to occur in late 2023 or early 2024.
- The Fed has raised overnight interest rates by 375 basis points so far this year, and rates are expected to top 5% by mid-2023. Taking into consideration the pace of the rate hikes, this has been one of the most intense monetary tightening cycles in Fed history.
- While core inflation has slowed modestly in recent months, it has also broadened into more persistent areas, such as core services, that will likely require a further slowdown in economic growth before inflation can return to more acceptable levels.
- Despite job growth cooling in recent months, the labor market remains extremely tight with nearly two job openings for every unemployed person.
- Although the US is not currently in a recession, core growth drivers, such as consumer spending and nonresidential business investment, have slowed. The growth tailwinds from pent-up demand following the COVID-19 pandemic have clearly subsided.

The window for a soft landing has narrowed—our quantitative model predicts a recession in late 2023 or early 2024 is more likely than not.

Smoothed probability of a US recession occurring in the next 18 months



Source: PitchBook | Geography: US
*As of October 31, 2022
Note: Predictions are out-of-sample and not made during a recession. See the Appendix for more details.

The Fed has already increased overnight rates by 375 basis points and is expected to tighten them by another 125 basis points by early 2023...

Federal funds rate with forward market expectations

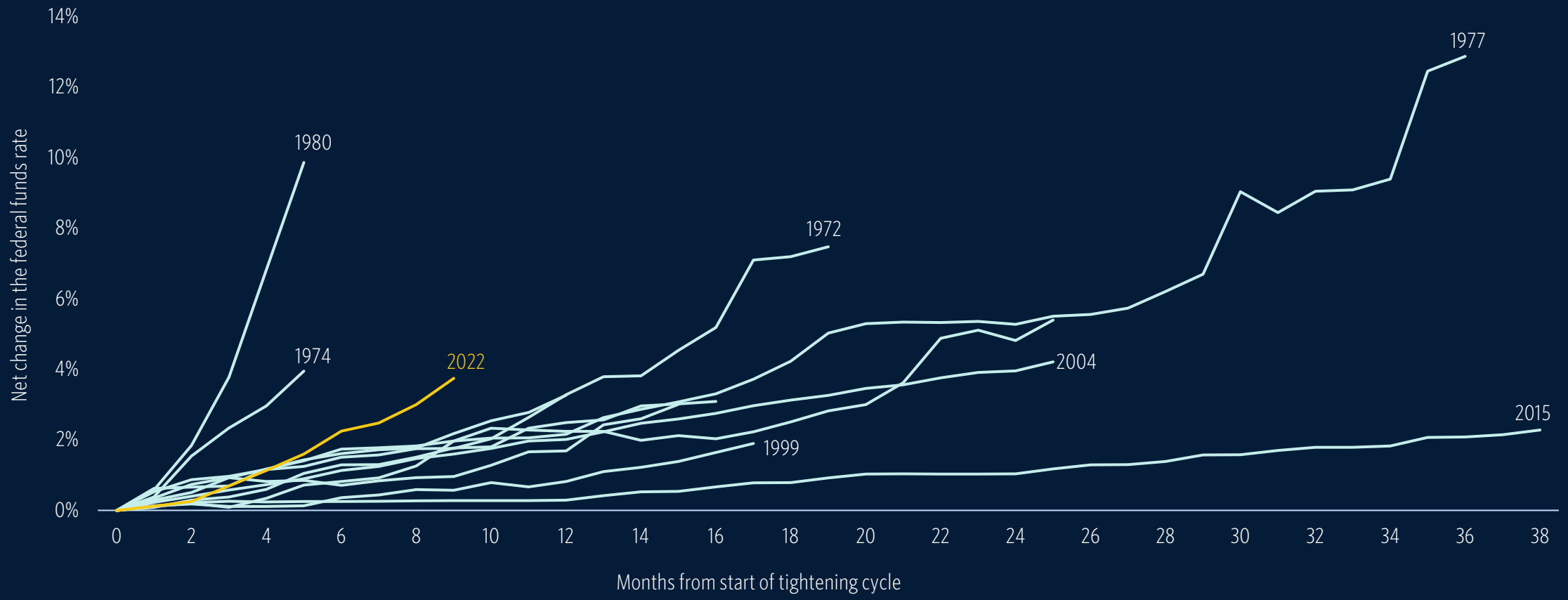
Source: Federal Reserve, CME Group | Geography: US
*As of November 17, 2022
Note: The long-run equilibrium is based on the Fed's latest Summary of Economic Projections.

Driven by inflation that is well above its 2% target, the Fed has sharply increased overnight interest rates into restrictive territory from 0.0% to 3.8%. By early 2023, it is likely that rates will top 5.0% based on market expectations and Fed guidance.

Inflation continues to be the key driver of monetary policy. Fed officials have made it abundantly clear that lowering inflation is not just their primary goal, but that some "pain" will be required to achieve this goal, including higher unemployment. It will be difficult to judge the sincerity of this commitment until growth and labor market conditions noticeably weaken. Until then, any talk of a Fed pivot (that is, transitioning from tightening to easing) is likely premature.

...which has resulted in one of the most intense tightening cycles in history, especially when considering the economy and asset prices are more sensitive to interest rate changes at lower levels.

Path of the federal funds rate in the current and prior Fed tightening cycles*

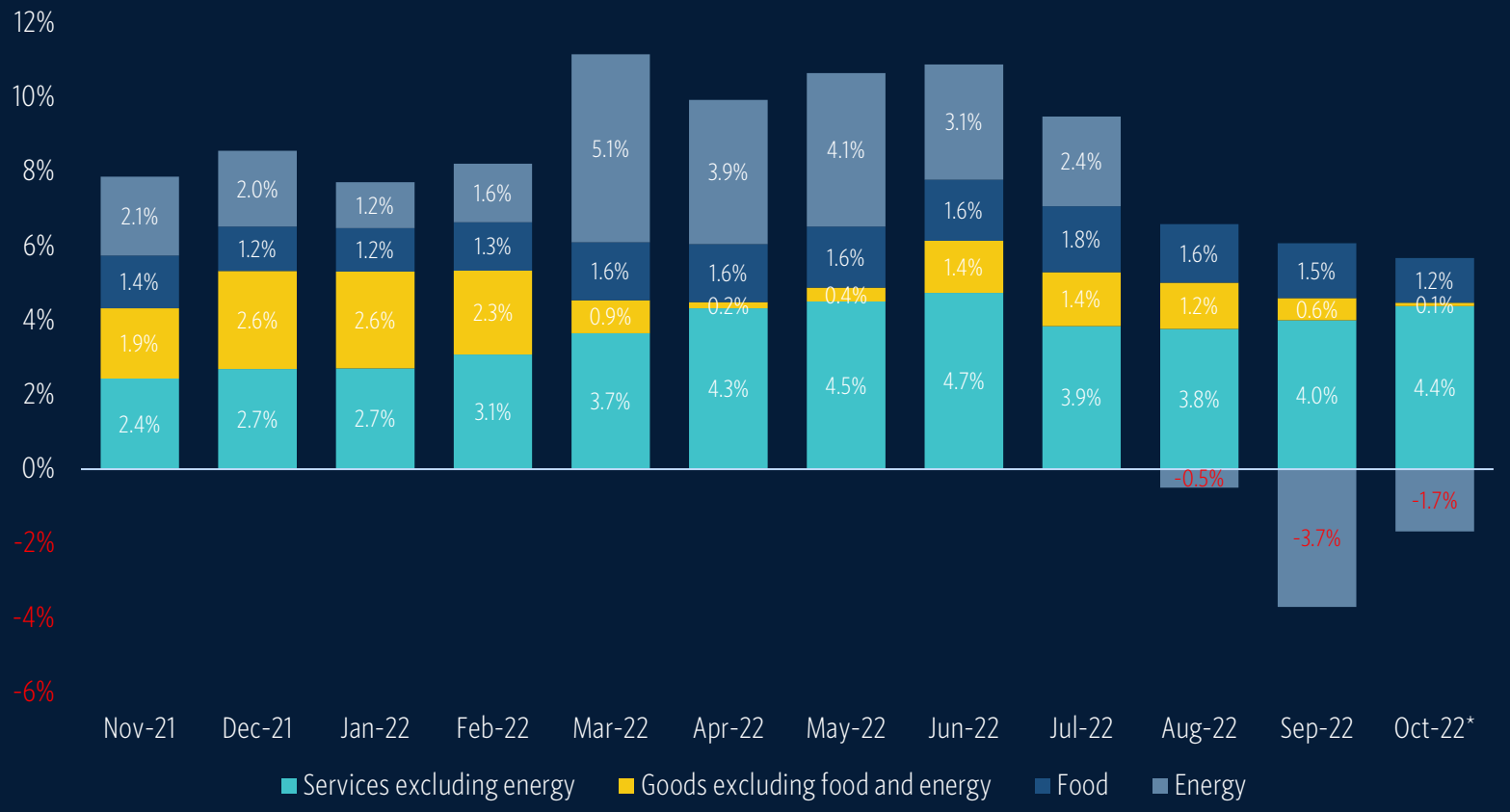


Source: Federal Reserve, PitchBook | Geography: US

*As of November 2, 2022

Although inflation has slowed, it has become more broad-based, making it too early to declare victory.

Contribution to CPI inflation by major category (three-month annualized rate)



Source: Bureau of Labor Services, PitchBook | Geography: US

*As of October 31, 2022

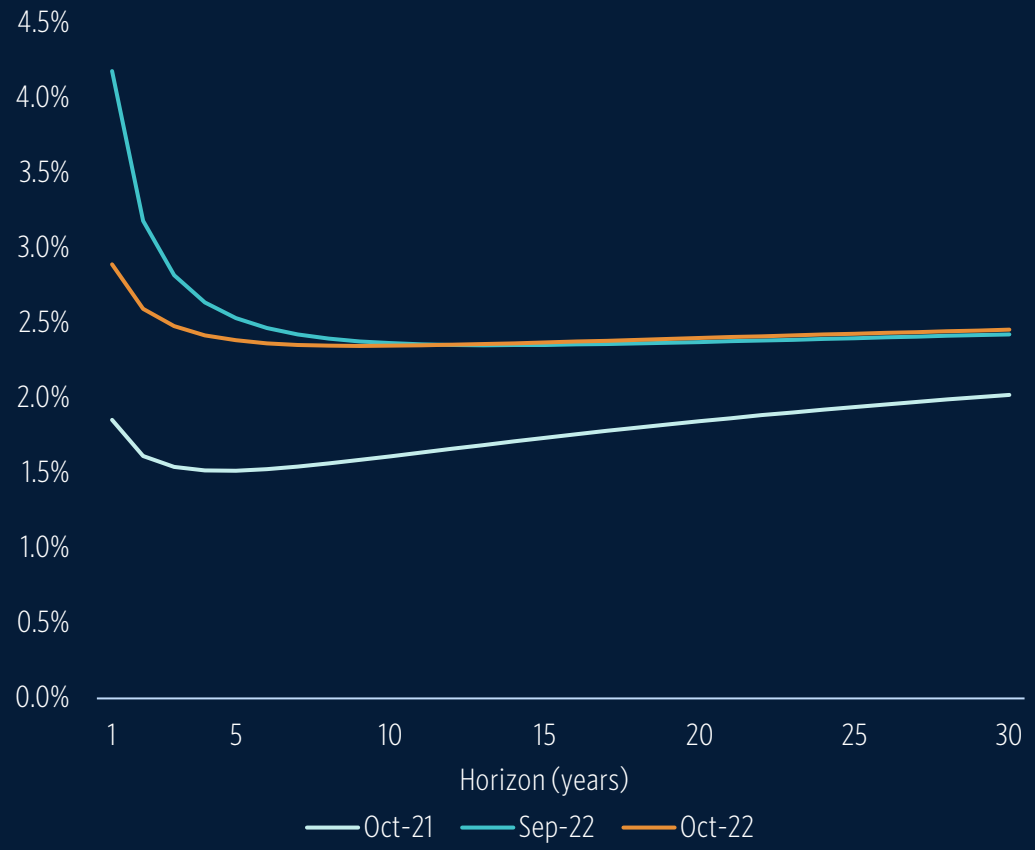
Inflation has evolved over the past several months—slowing overall, but also broadening into more persistent areas. In late 2021 and early 2022, inflation was mainly caused by supply issues pushing up core good prices. From there, the main driver shifted to energy. More recently, the inflationary trends in core goods and energy have reversed, and inflation has shifted into core services. Core service inflation, particularly rent, is closely related to personal income and wage growth, and is unlikely to dissipate without economic weakness.

While the October Consumer Price Index (CPI) print was promising and inflation is likely to trend lower in the coming months, we think that it is too early to declare victory. The key question will be what the path lower looks like and how much inflation above 2% the Fed is willing to accept.

Measures of core inflation remain well above 2%, but long-term inflation expectations have risen only modestly to 2.5%.

Select core inflation measures (three-month annualized rate)

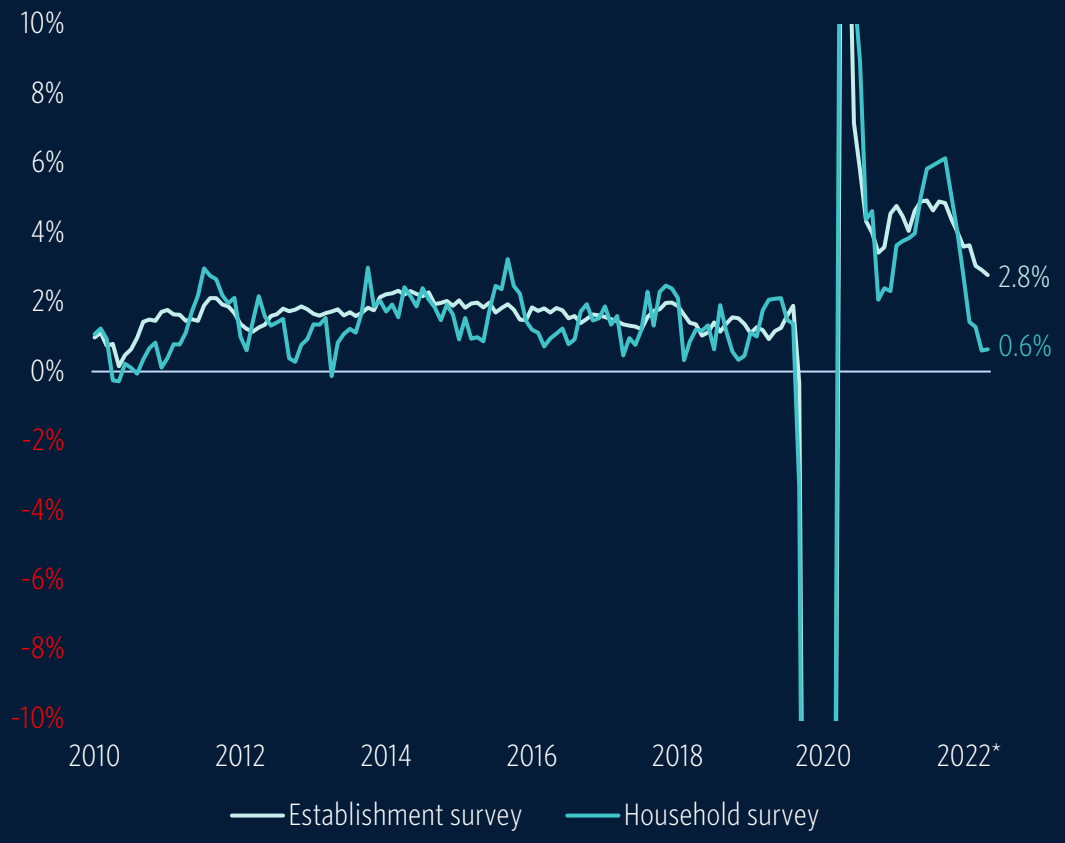
Expected inflation term structure*



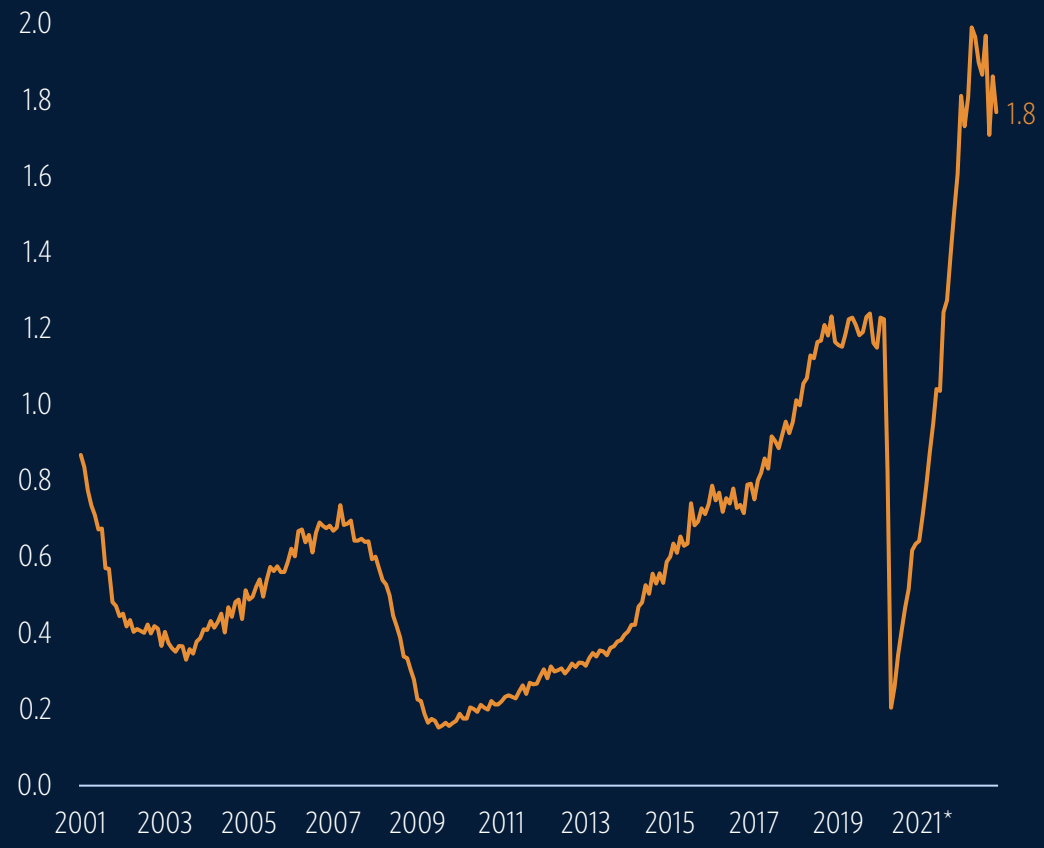
Source: Bureau of Labor Services, Cleveland Fed | Geography: US
*As of October 31, 2022
Note: See Glossary for term definitions.

Job growth has cooled slightly, but nearly two job openings remain for every unemployed person...

Employment growth (six-month annualized rate)



Ratio of job openings to total unemployed persons

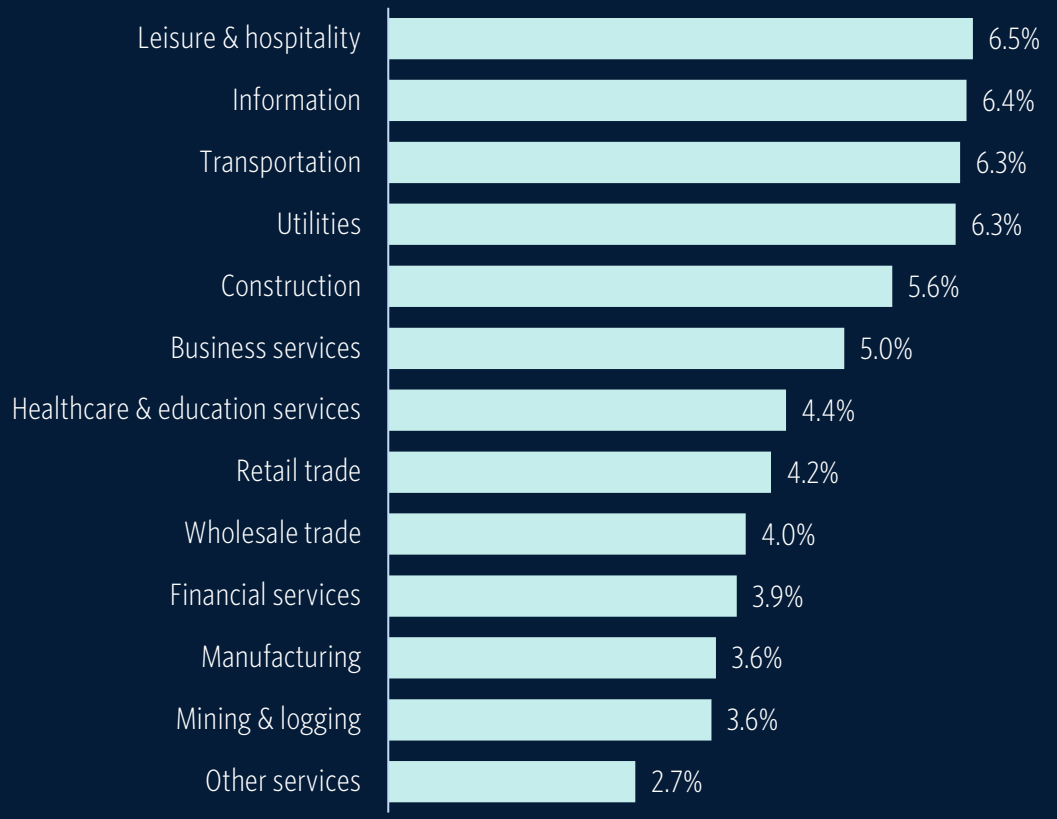


Source: Bureau of Labor Services | Geography: US
*As of October 31, 2022
Note: Job openings data is as of September 30, 2022.

...and while wage growth may have peaked, it is still adding to inflationary pressures.

Wage growth (six-month annualized rate)

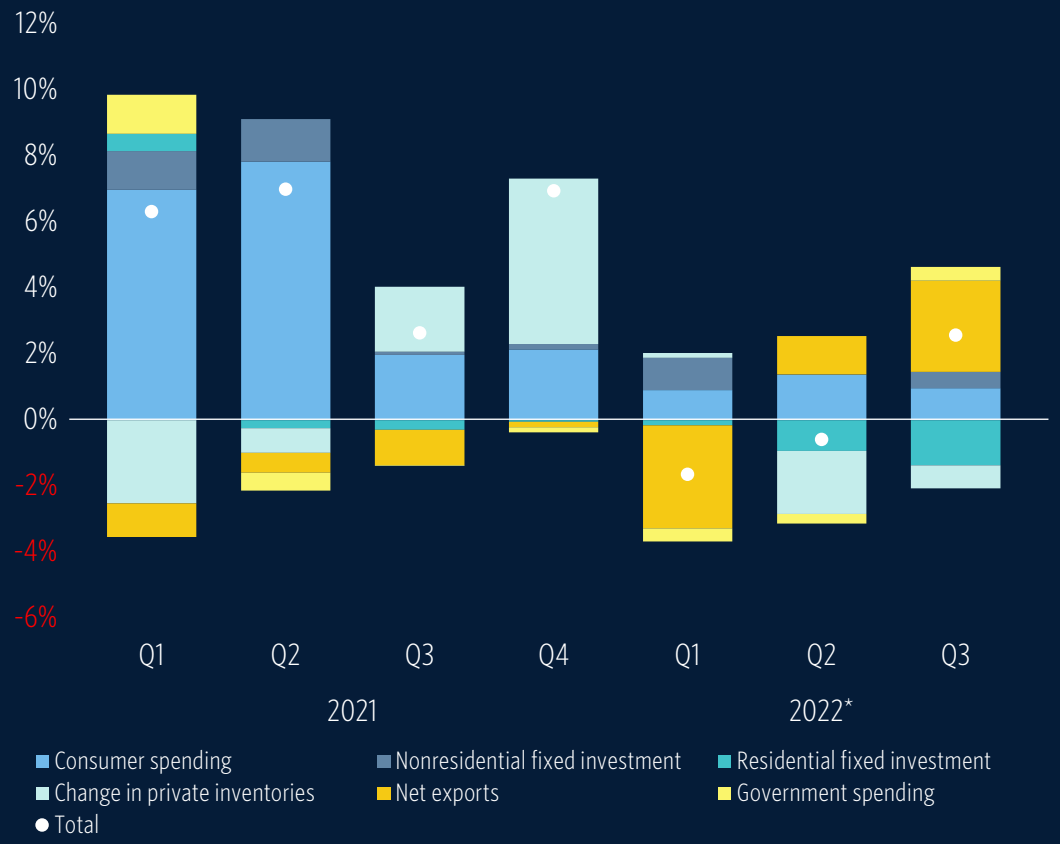
Wage growth by sector (six-month annualized rate)*



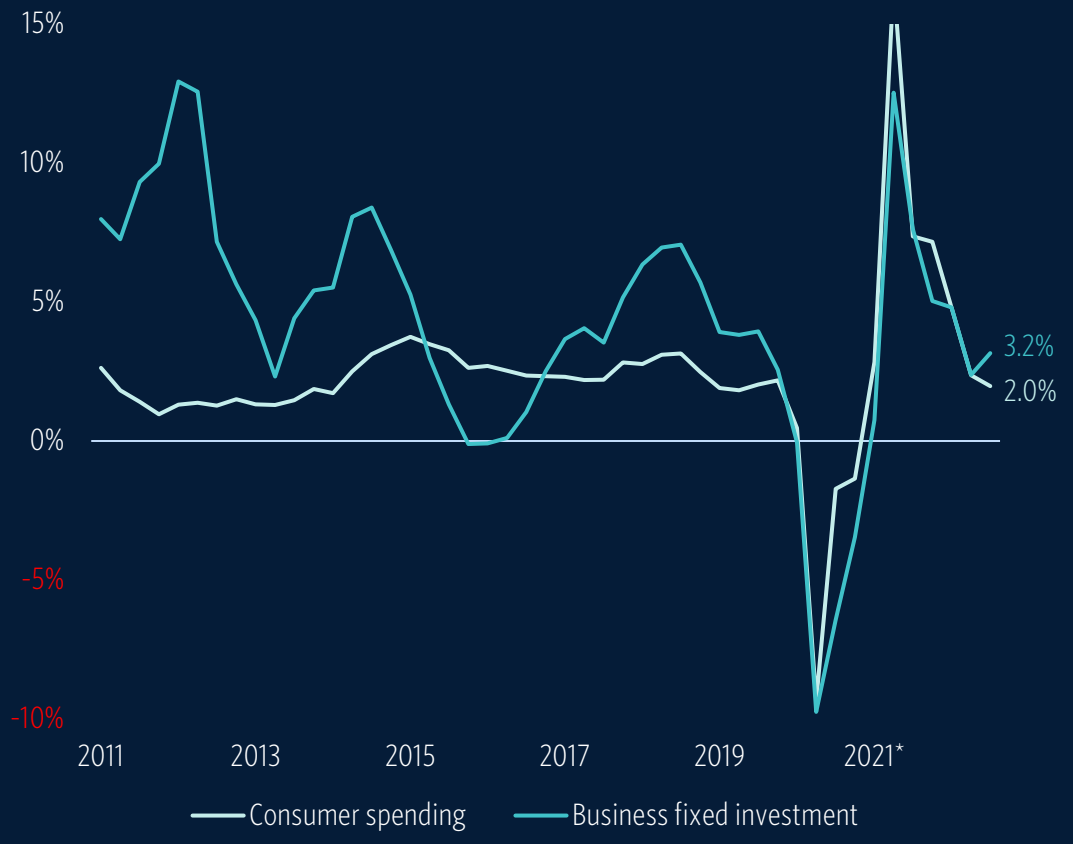
Source: Atlanta Fed, Bureau of Economic Analysis, Bureau of Labor Services | Geography: US
*As of October 31, 2022
Note: Total wages and salaries are represented by the Employer Cost Index and is as of September 30, 2022.

Although the US is not currently in a recession, growth has slowed meaningfully so far in 2022...

Contribution to quarterly real GDP growth (annualized)



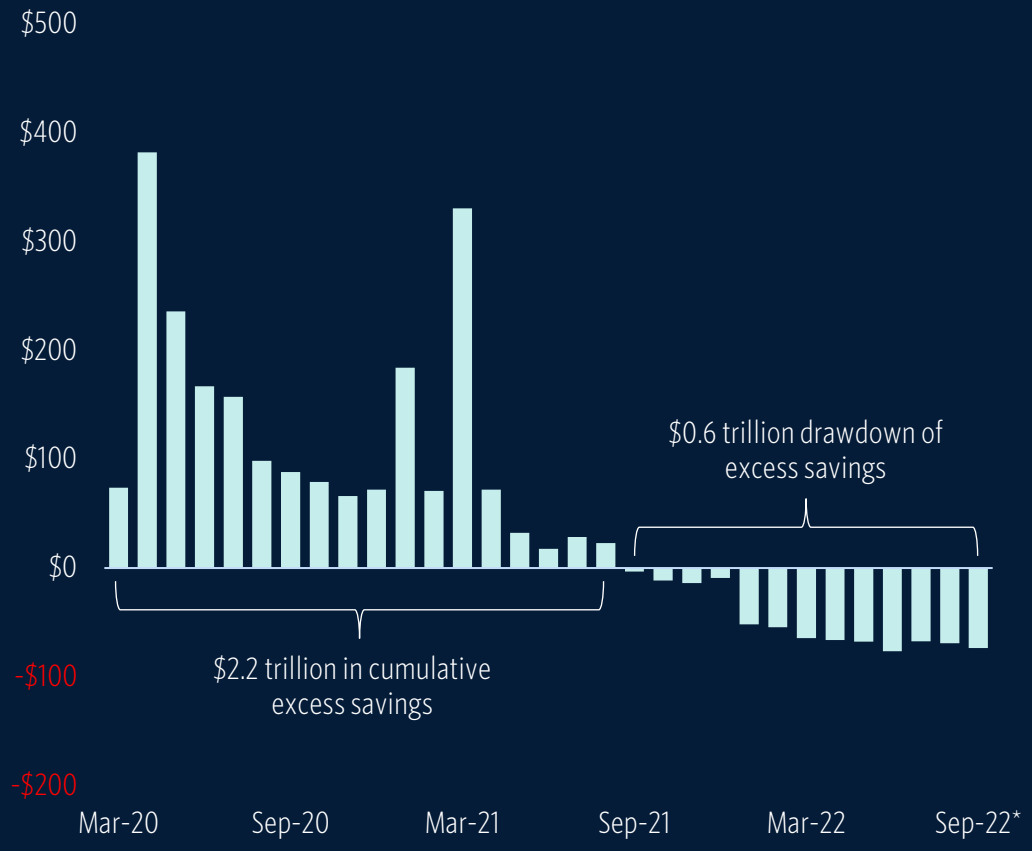
Growth in core GDP drivers (year-over-year)



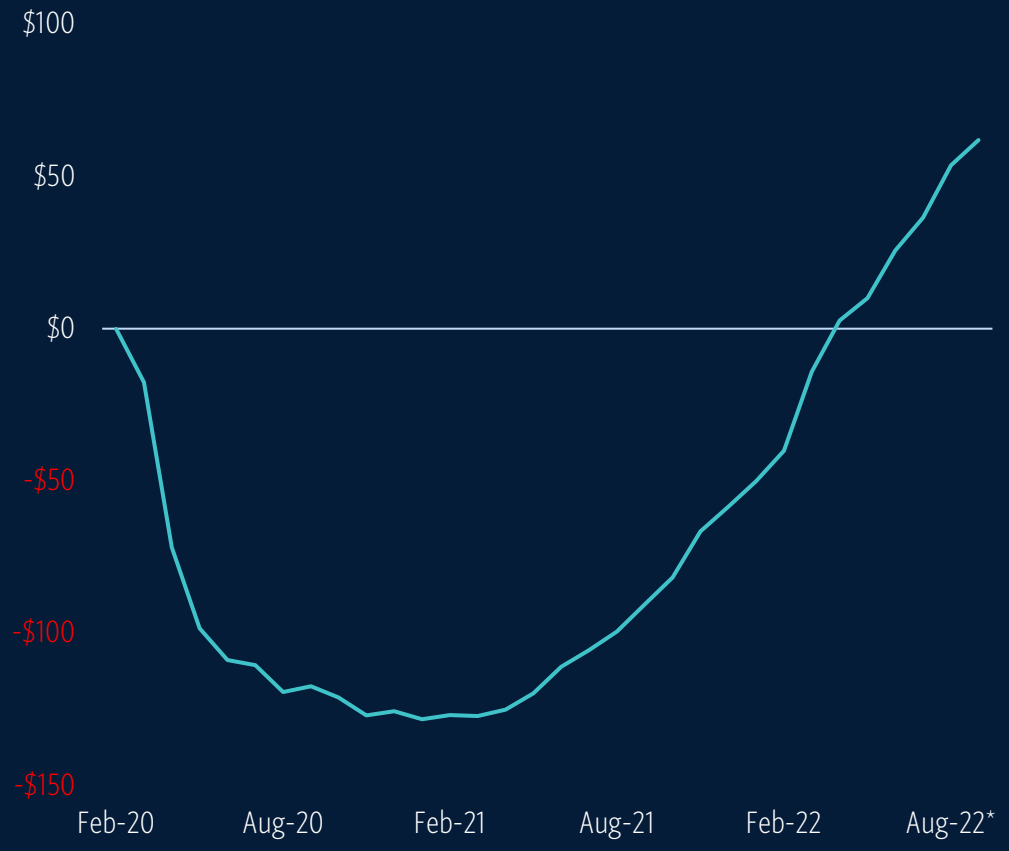
Source: Bureau of Economic Analysis | Geography: US
*As of September 30, 2022
Note: Q3 2022 GDP data is from the advanced estimate.

...and while consumers are still sitting on a pile of excess savings in aggregate, increases in credit card balances despite surging interest rates suggest these savings are unevenly distributed.

Real excess consumer savings ($B)



Cumulative change in consumer revolving credit outstanding ($B)



Source: Bureau of Economic Analysis, Federal Reserve | Geography: US
*As of September 30, 2022

Note: Excess savings are the deviation of personal disposable income less spending from its pre-COVID trend. Revolving credit is indexed to February 2020.

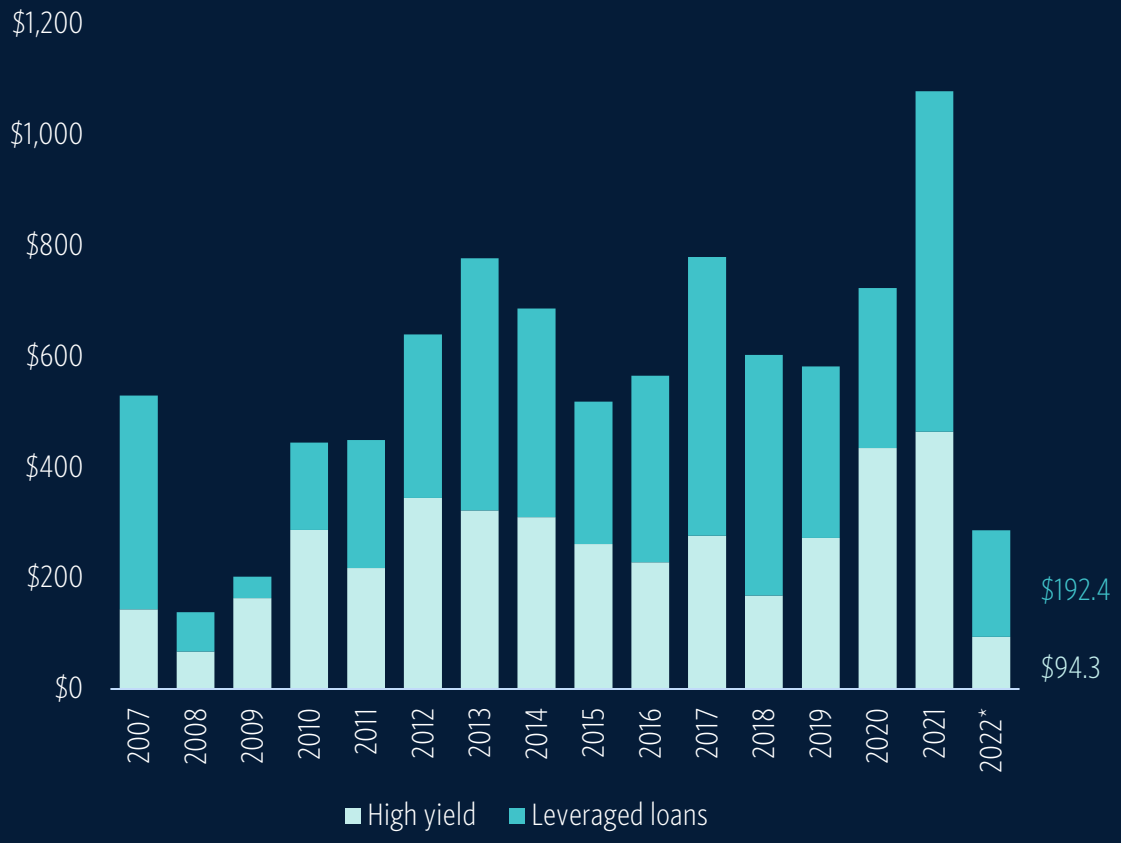
Credit and liquidity concerns

Key takeaways

- Credit has rapidly become scarce as lending standards have tightened, especially for riskier borrowers. In the latest Senior Loan Officer Survey, a net 39.1% of commercial banks indicated they are tightening credit standards on business loans, a level that is consistent with previous recessions.
- Tighter credit conditions and rising benchmark interest rates have shut off the leveraged loan market, which has been the primary source of buyout debt in recent years. Trailing six-month leveraged loan issuance for buyouts registered just $22.3 billion through October, the lowest level since mid-2020.
- Aggregate buyout deal value has held up better than expected based on its historical relationship with leveraged loan issuance, suggesting alternative debt providers, such as business development corporations and other direct lenders, may be stepping in to fill the funding gap.
- A hypothetical buyout deal with the average leverage ratio of 6x EBITDA and the average new issue financing yield of near 12% would have an interest coverage ratio of just 1.4x. A further rise in debt costs, combined with the possibility of a decline in earnings, has the potential to create liquidity issues for buyout-backed companies.
- PE exit activity has fallen off much more than deal activity to below its short- and long-term trends. Liquidity from public listings has completely dried up, while sales to financial sponsors have continued to take up a greater share of overall exits.

Credit has rapidly become scarce as lending standards have tightened to levels consistent with prior recessions.

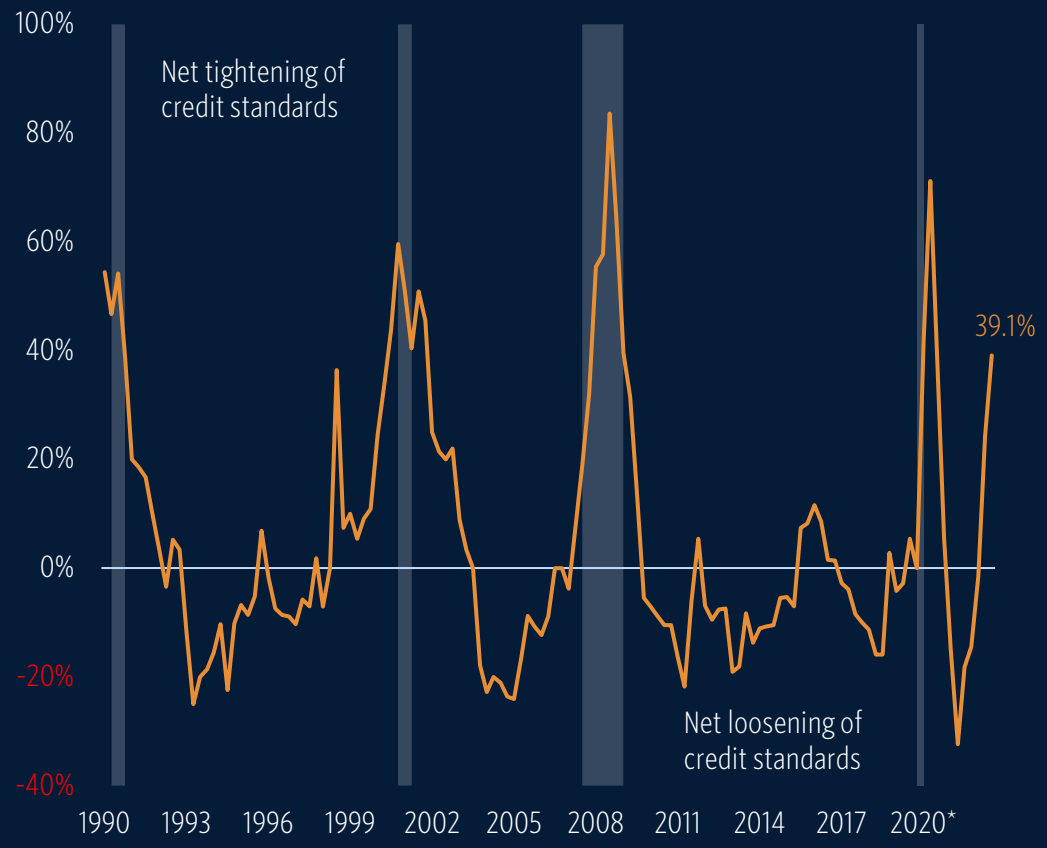
Leveraged debt issuance ($B)



Source: LCD | Geography: US

*As of October 31, 2022

Net percentage of banks tightening credit standards on commercial loans to medium-sized and large businesses



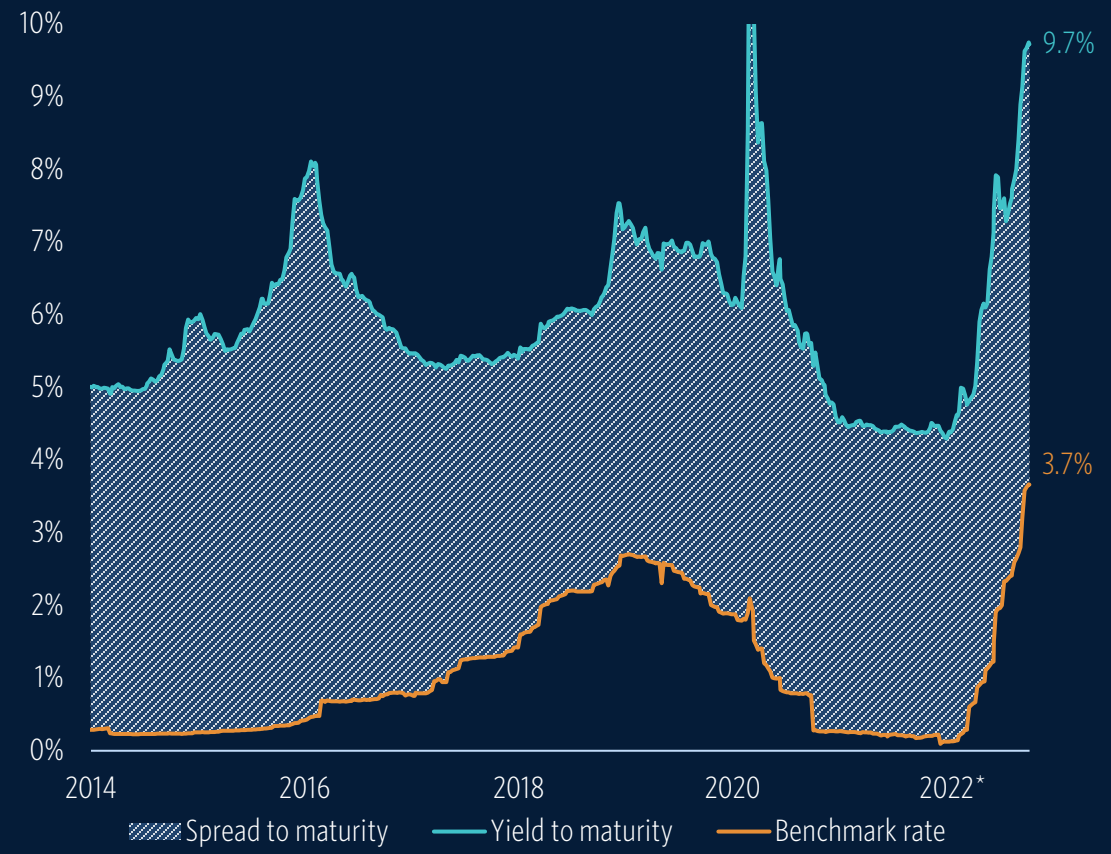
Source: Federal Reserve, Senior Loan Officer Survey | Geography: US

*As of November 7, 2022

Tighter credit conditions and higher benchmark rates have shut off the leveraged loan market, which has been the primary source of buyout debt in recent years.

Rolling six-month leveraged loan issuance ($B) for buyouts

Yield to maturity attribution for B-rated leveraged loans

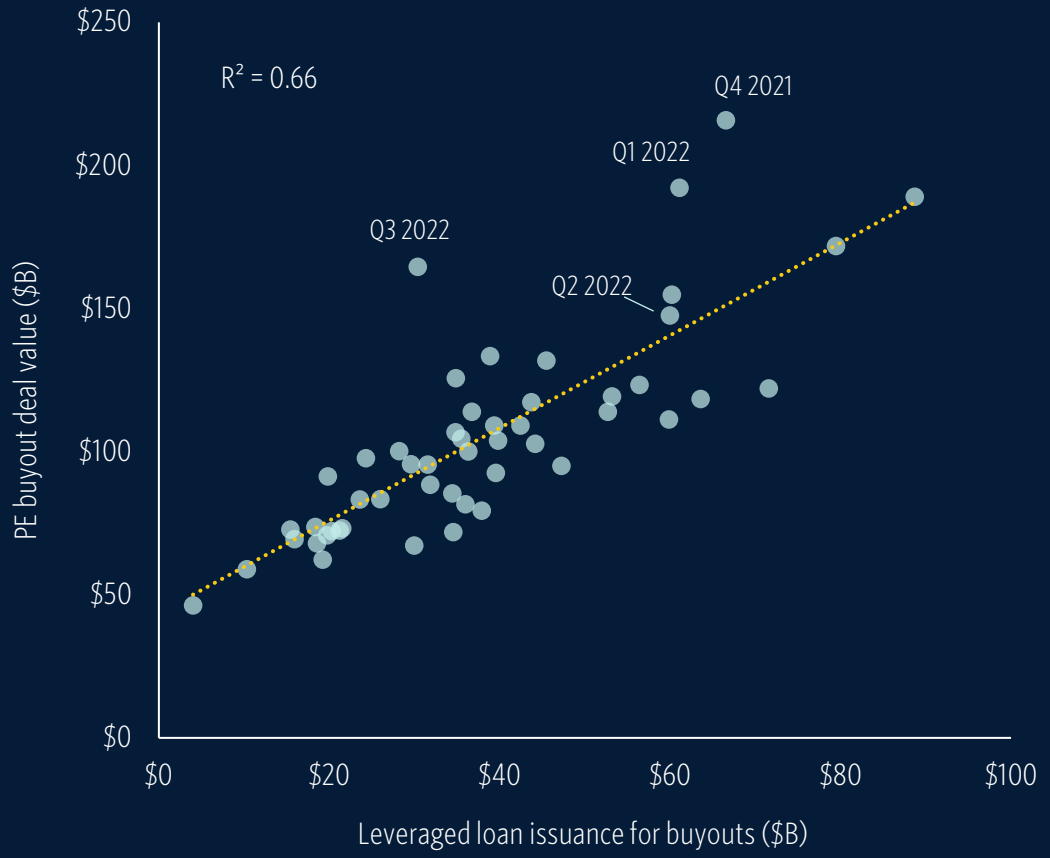


Source: LCD | Geography: US

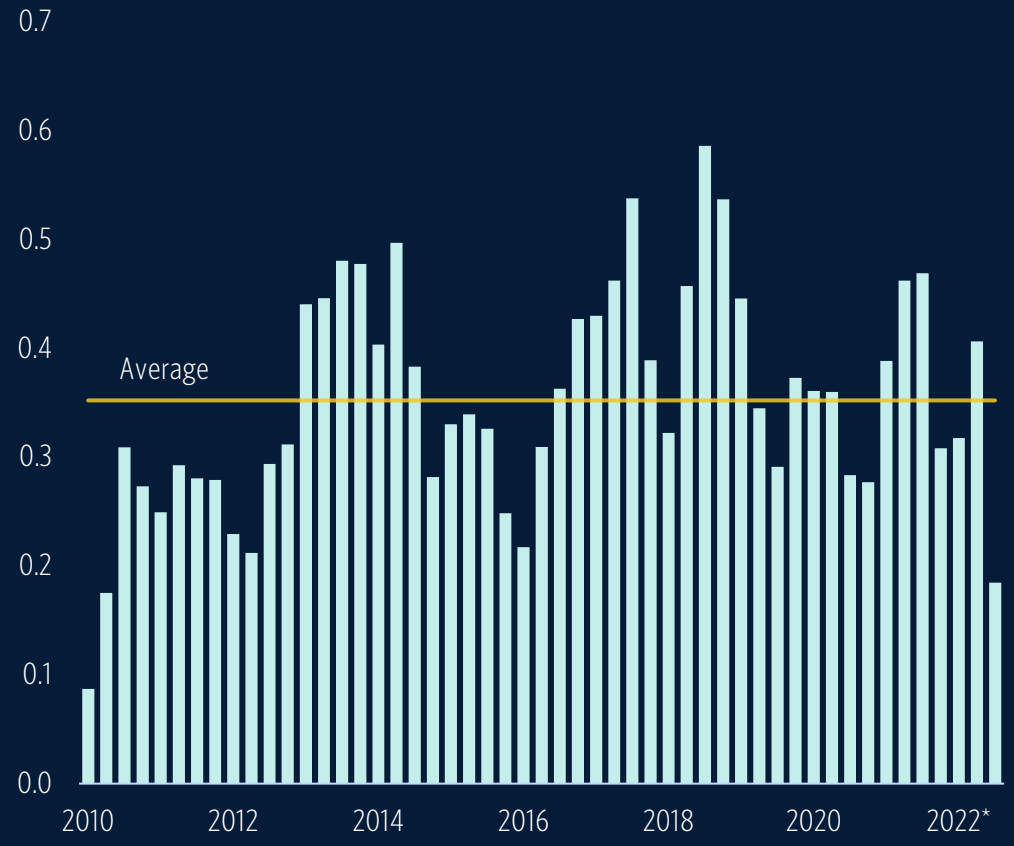
*As of October 31, 2022

Through Q3 2022, buyout dealmaking held up better than expected given the falloff in loan issuance.

Relationship between leveraged loan issuance and aggregate buyout deal value since 2010*



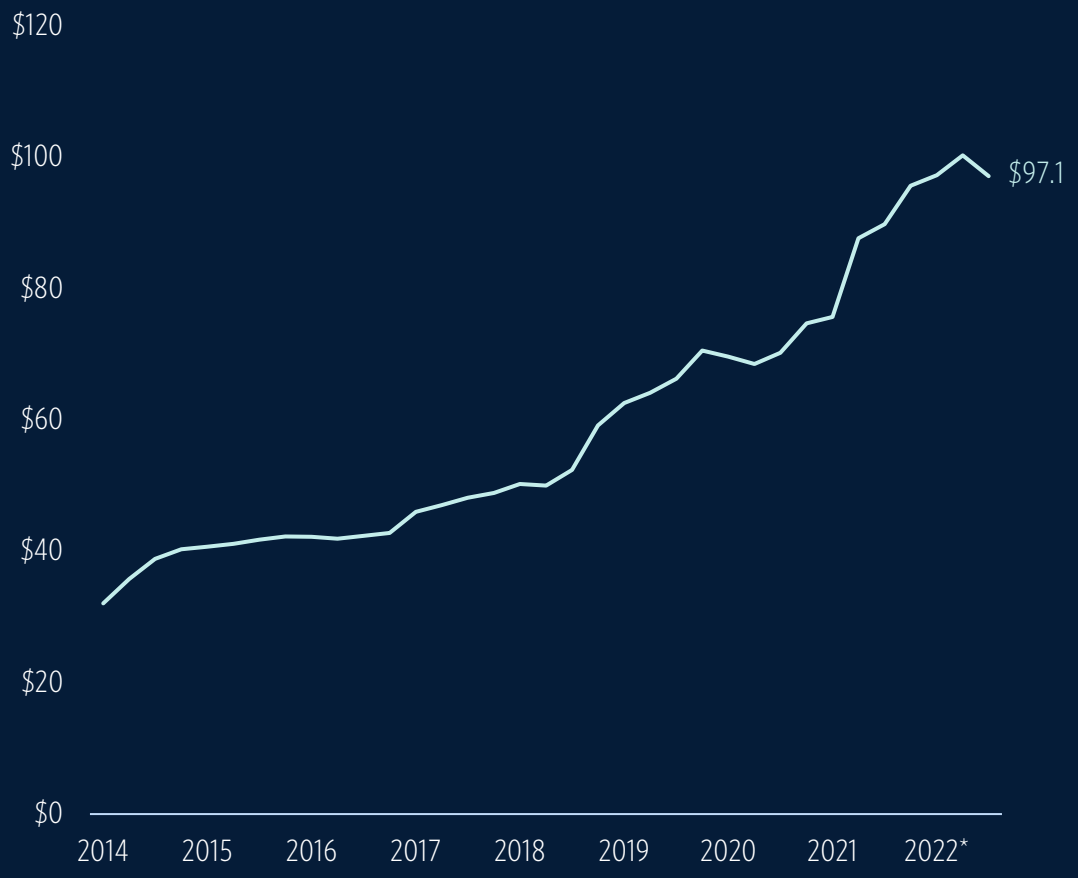
Ratio of leveraged loan issuance for buyouts to aggregate buyout deal value



Source: PitchBook, LCD | Geography: US
*As of September 30, 2022
Note: Six-month rolling data with PE deal value estimates for the most recent four quarters.

Lending by business development corporations (BDCs), a proxy for private credit, has also slowed, but less so than in the syndicated loan market.

BDC total loan assets at fair value ($B)

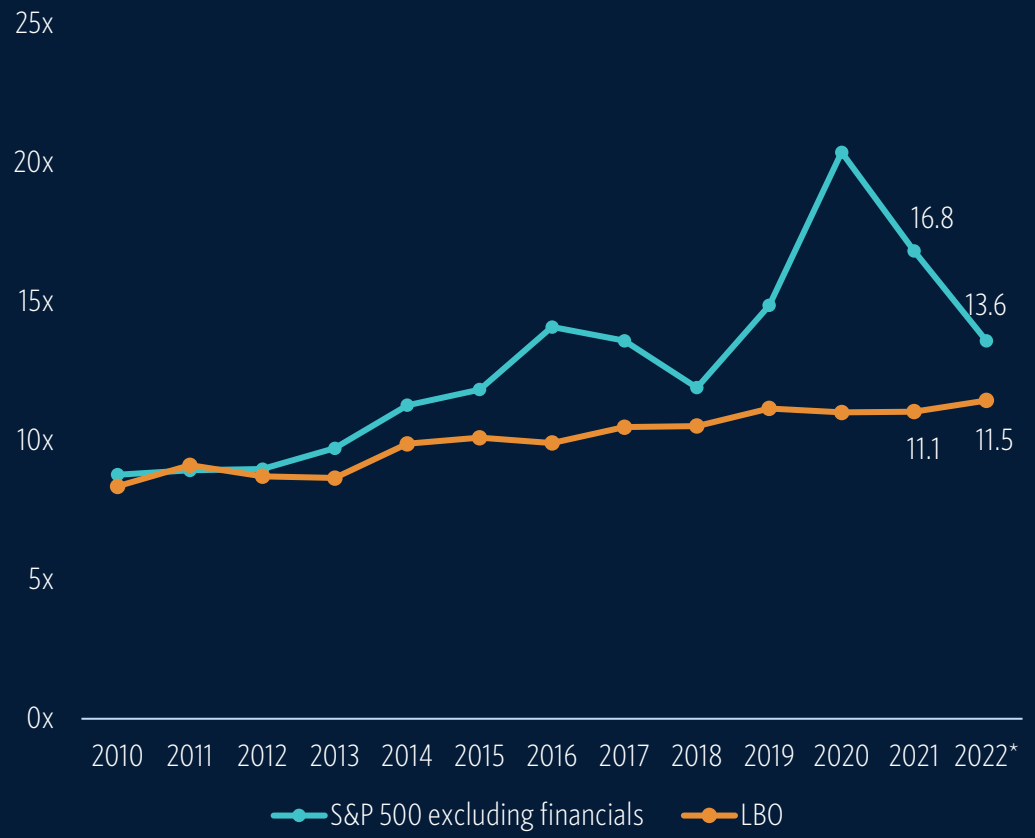


BDC trailing six-month net new loans ($B)

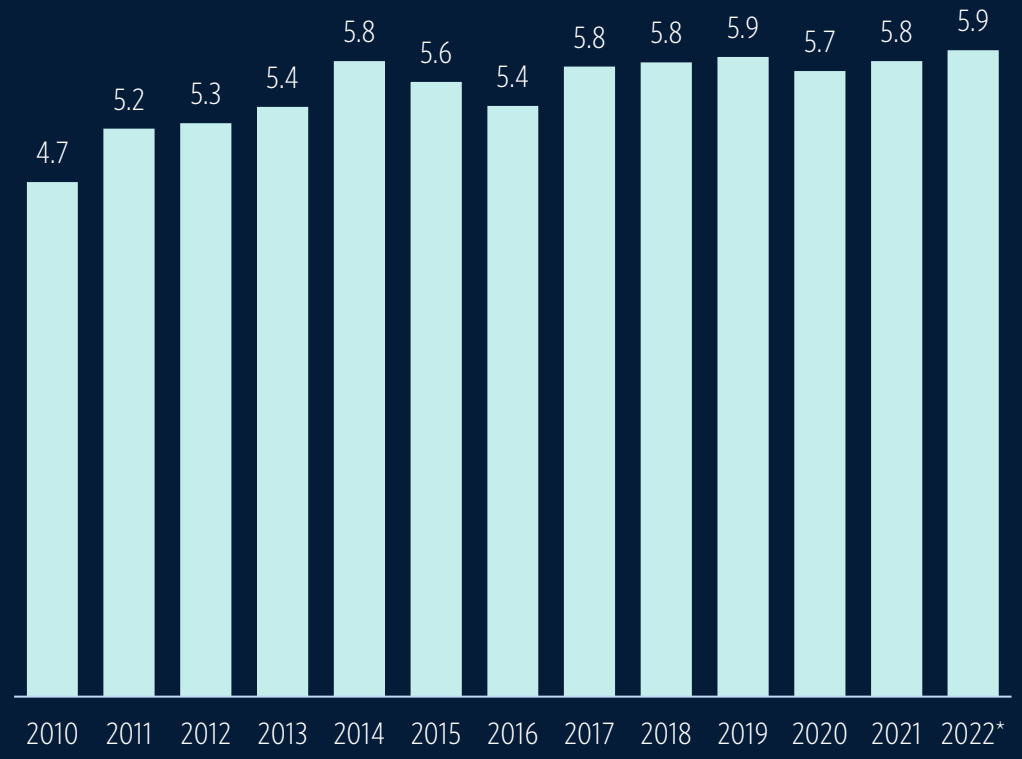
Source: Morningstar | Geography: US
*As of September 30, 2022
Note: The BDCs included in the data are based off the holdings of the Van Eck BDC Income ETF.

Despite falling valuations in the public market and significantly higher leverage costs, buyout valuations and leverage on completed deals so far in 2022 have hardly changed.

Public equity versus buyout EV/EBITDA** multiples



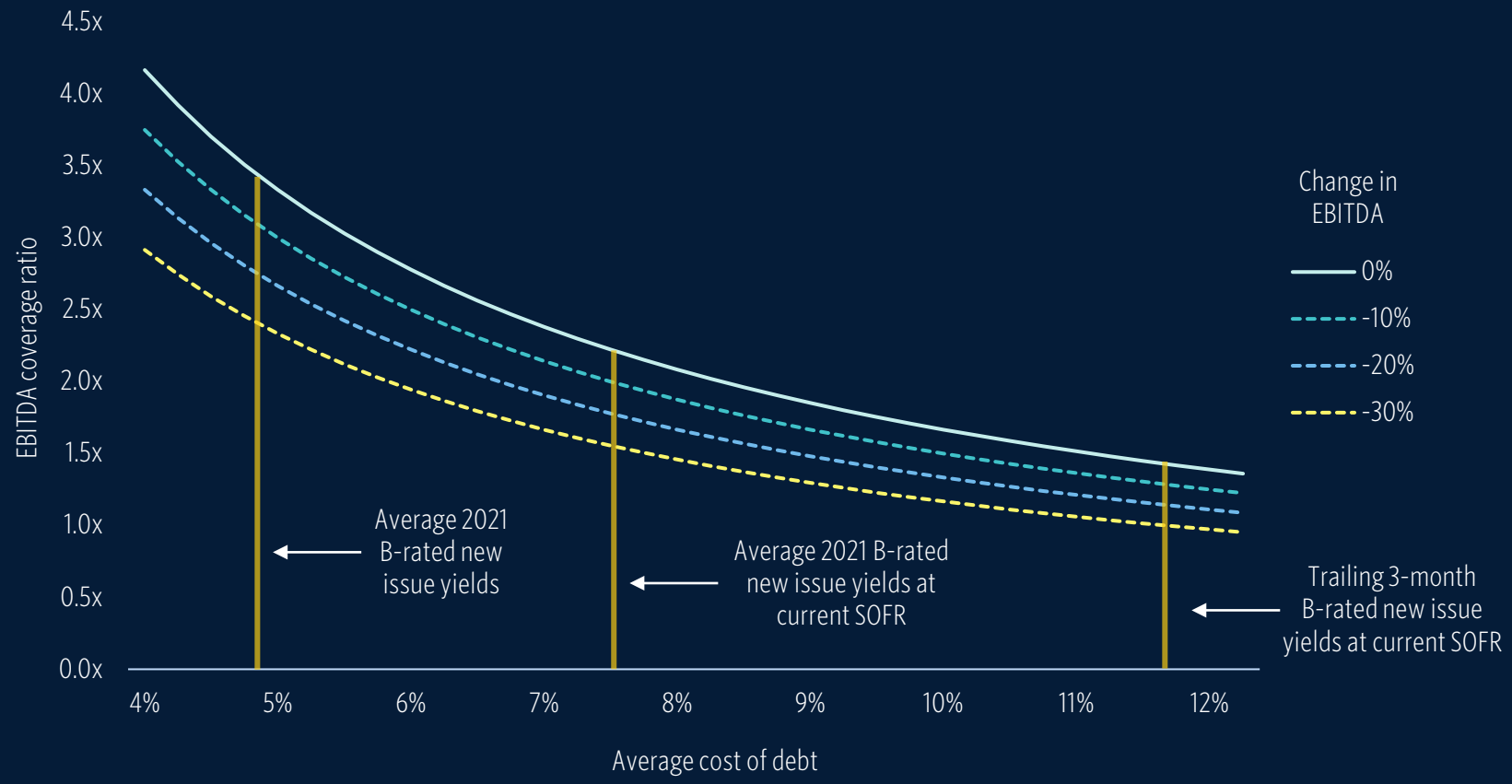
Buyout debt/EBITDA ratios



Source: LCD, Morningstar | Geography: US
*As of September 30, 2022
***LBO multiples use purchase price in the numerator.*

Sharp increases in the cost of debt to fund buyouts have driven interest coverage ratios lower, increasing liquidity risk, especially if earnings fall.

Interest coverage ratios by cost of debt and change in EBITDA*



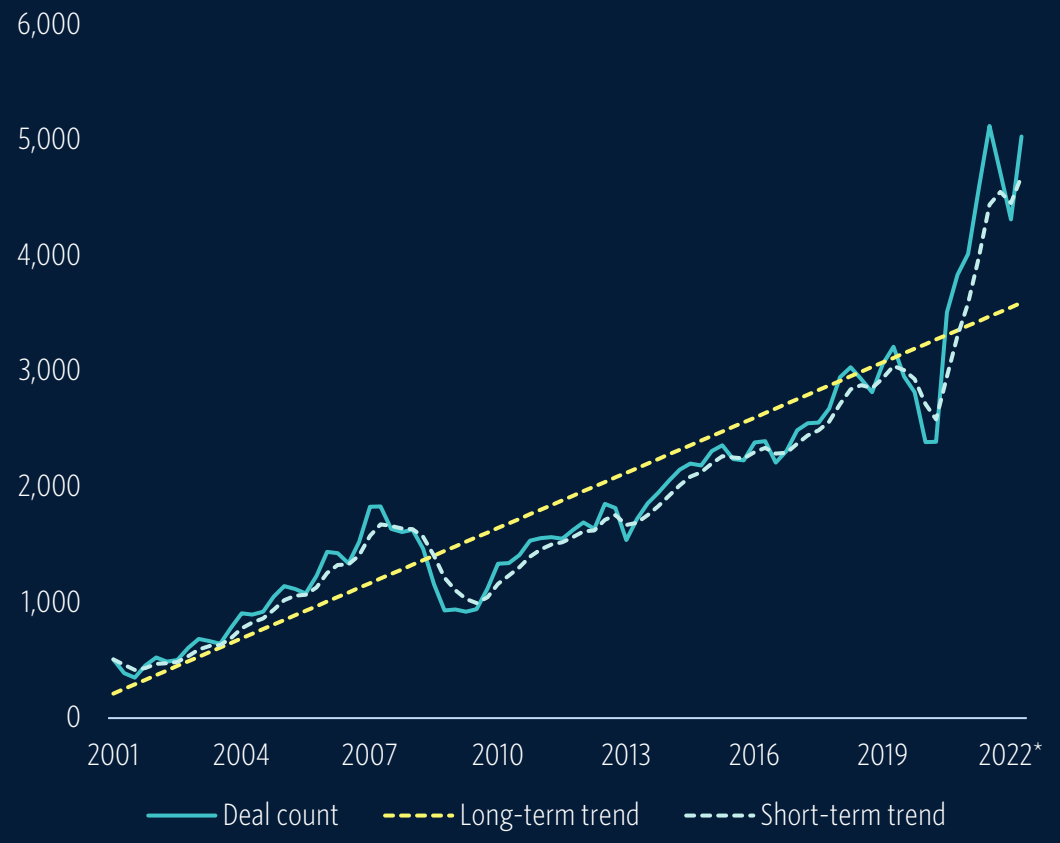
Source: PitchBook, LCD | Geography: US
*As of November 14, 2022
Note: Assumes a starting leverage ratio of 6x EBITDA. Current SOFR is 3.8%.

In 2021, benchmark lending rates were near zero and credit spreads were tight, resulting in very low buyout debt costs and comfortable interest coverage ratios. Assuming a starting leverage ratio of 6x EBITDA and the average 2021 B-rated new leveraged loan issue yield, a buyout-backed company would have had a coverage ratio of nearly 3.5x.

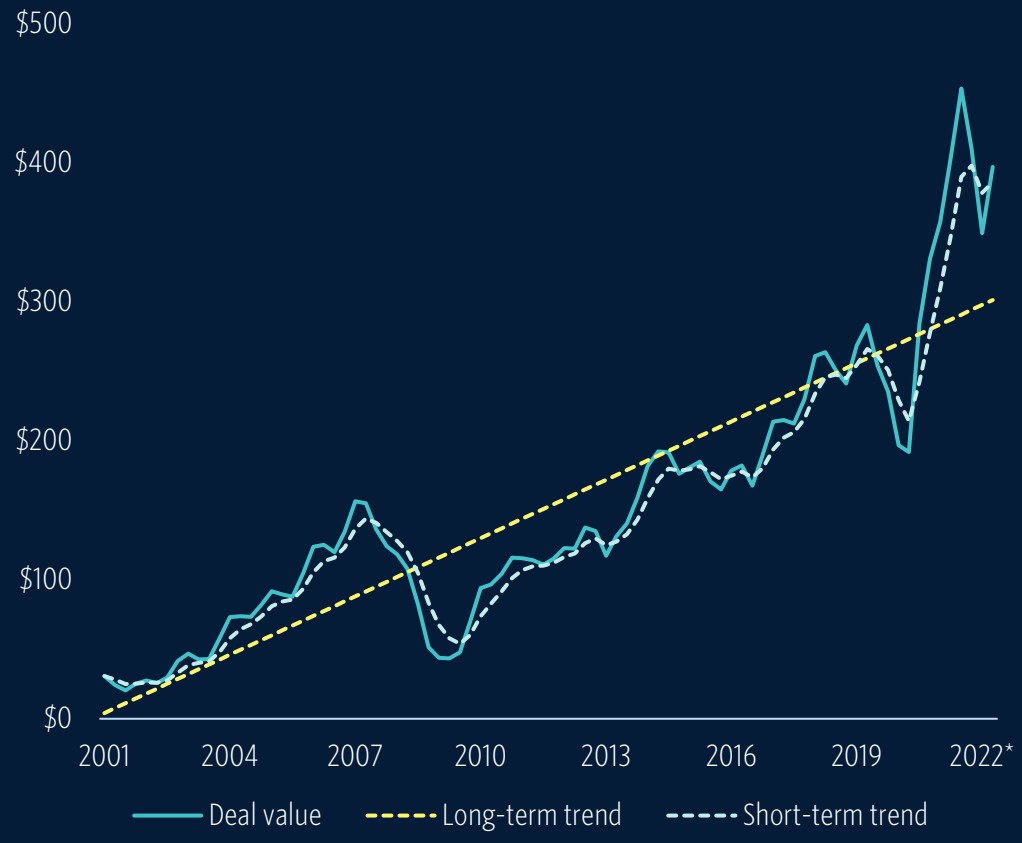
Now that benchmark lending rates are nearing 4% and credit spreads have widened, liquidity risks in buyout-backed companies are rising. Based on trailing three-month B-rated new issue yields and a starting leverage ratio of 6x, interest coverage would only be 1.4x.

PE dealmaking has been remarkably resilient so far in 2022...

Rolling six-month PE deal count trends



Rolling six-month PE deal value ($B) trends



Source: PitchBook | Geography: US
*As of September 30, 2022
Note: Data is seasonally adjusted and includes estimates for the most recent four quarters.

...but short-term dealmaking momentum has slowed from record levels...

Trailing six-month PE deal trends dashboard*

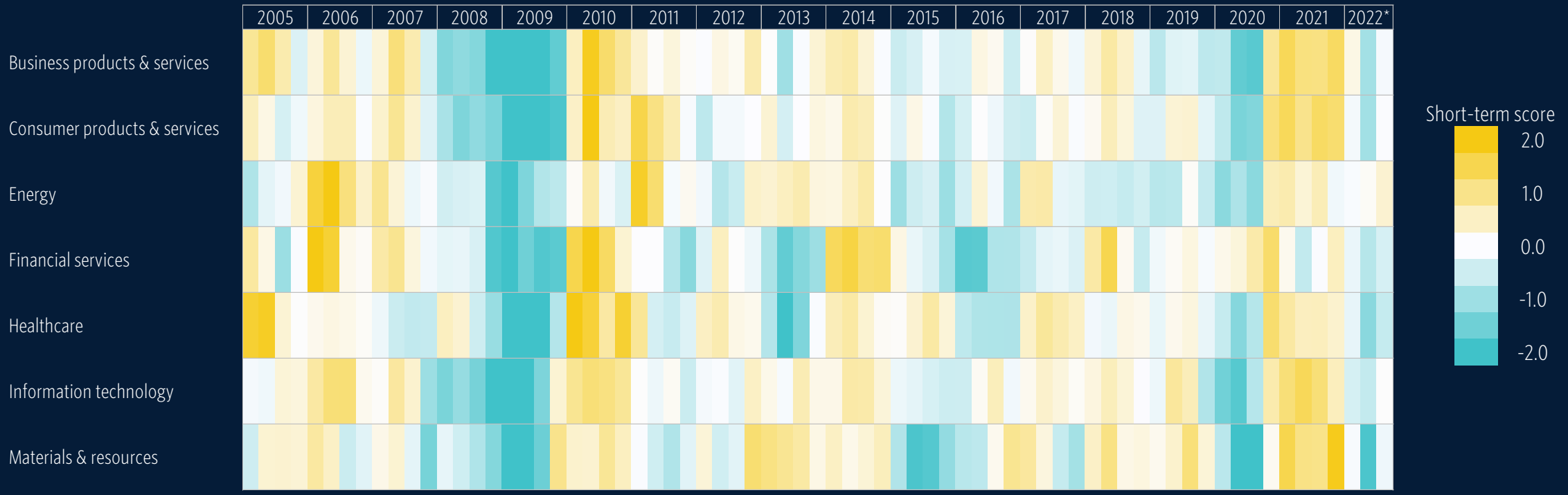
		Deal count				Deal value			
	Segment	Current	% of total	Long-term score	Short-term score	Current ($B)	% of total	Long-term score	Short-term score
	Total	5,032	100.0%	3.18	0.46	$397.4	100.0%	2.13	-0.08
Sector	Business products & services	1,890	38.3%	3.28	0.51	$136.2	34.8%	2.11	-0.07
Sector	Consumer products & services	866	17.5%	3.46	0.83	$60.2	15.4%	1.82	-0.02
Sector	Energy	141	2.9%	-0.85	0.42	$21.3	5.4%	-0.05	0.39
Sector	Financial services	425	8.6%	3.46	0.21	$36.0	9.2%	1.59	-0.40
Sector	Healthcare	705	14.3%	1.90	-0.46	$51.6	13.2%	1.00	-0.58
Sector	Information technology	819	16.6%	2.27	-0.07	$75.1	19.2%	2.40	0.03
Sector	Materials & resources	95	1.9%	0.25	0.03	$11.3	2.9%	0.86	-0.14
Type	Buyout (all)	4,061	80.7%	2.92	0.36	$346.0	87.1%	1.93	-0.10
Type	Buyout (add-on)	3,167	62.9%	3.57	0.52	$227.0	57.1%	2.69	0.06
Type	PE growth	882	17.5%	3.02	0.13	$45.6	11.5%	2.14	-0.42

Source: PitchBook | Geography: US
*As of September 30, 2022
Note: Data is seasonally adjusted and includes estimates for the most recent four quarters.

The PE deal trends dashboard provides a quantitative assessment of overall deal activity in the past six months, as well as within each sector and deal type after adjusting for seasonality and reporting lags. The long- and short-term scores represent z-score normalized deviations from a full-period linear trendline and a 12-month exponential moving average, respectively.

...across several key sectors, including healthcare and technology.

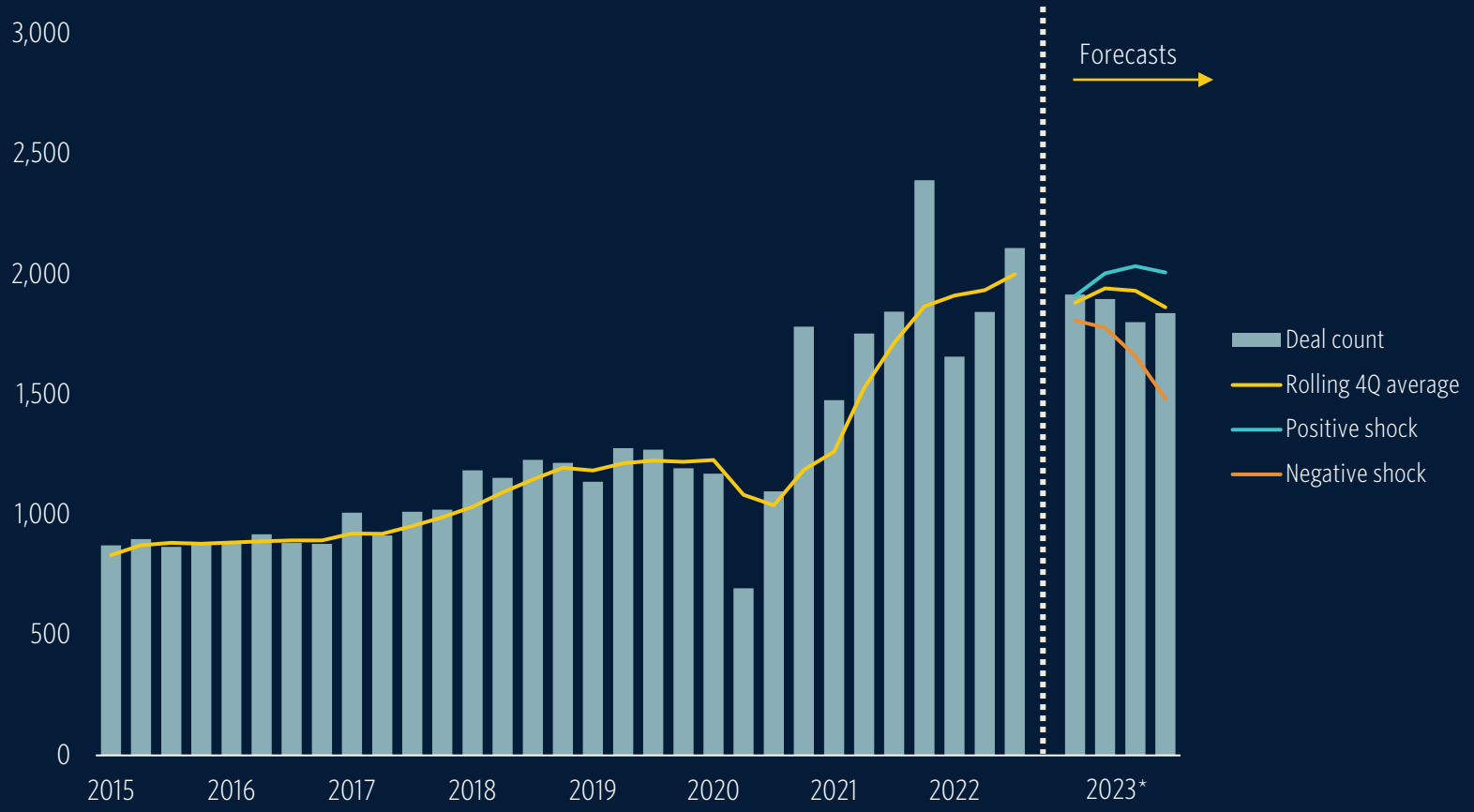
Rolling six-month PE deal value trends by sector



Source: PitchBook | Geography: US
*As of September 30, 2022
Note: Short-term score represents the z-score of the deviation from short-term trend.

Based on trends and current market conditions, our quantitative model expects buyout deal activity to continue to slow modestly.

Quarterly buyout deal count with year-ahead forecasts



Source: PitchBook | Geography: US

*As of September 30, 2022

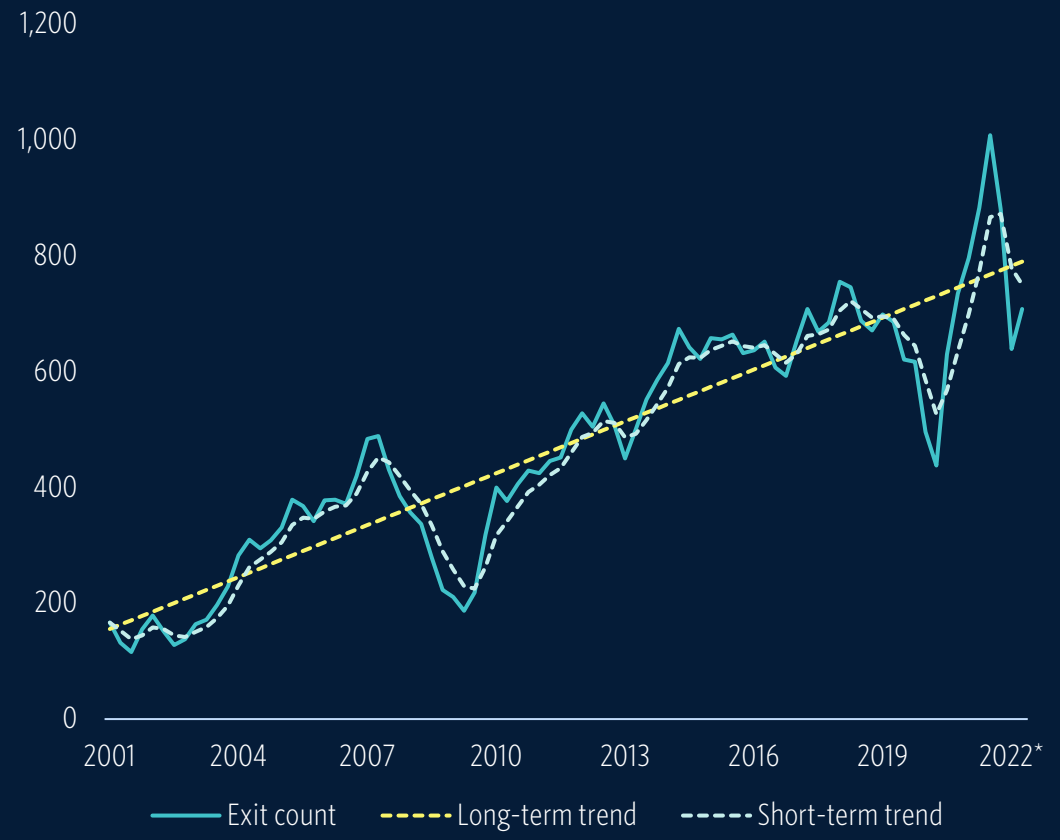
The foundation of our deal forecasting model is a time series algorithm that fits a flexible linear trend to the historical data. We then overlay this with a regression model to adjust the trend prediction for market conditions, proxied by the high-yield credit spread, as well as lagged deviations from trend. Intuitively, wider high-yield spreads have been associated with below-trend deal activity.

Based on the current market conditions, the model predicts buyout deal activity in the next four quarters to be about 10% lower than activity in the previous four quarters. In addition to the baseline forecast, we show forecasts for positive and negative shocks, defined as credit spreads instantaneously moving to 300 and 1,000 basis points, respectively, from the current level of 500 basis points.

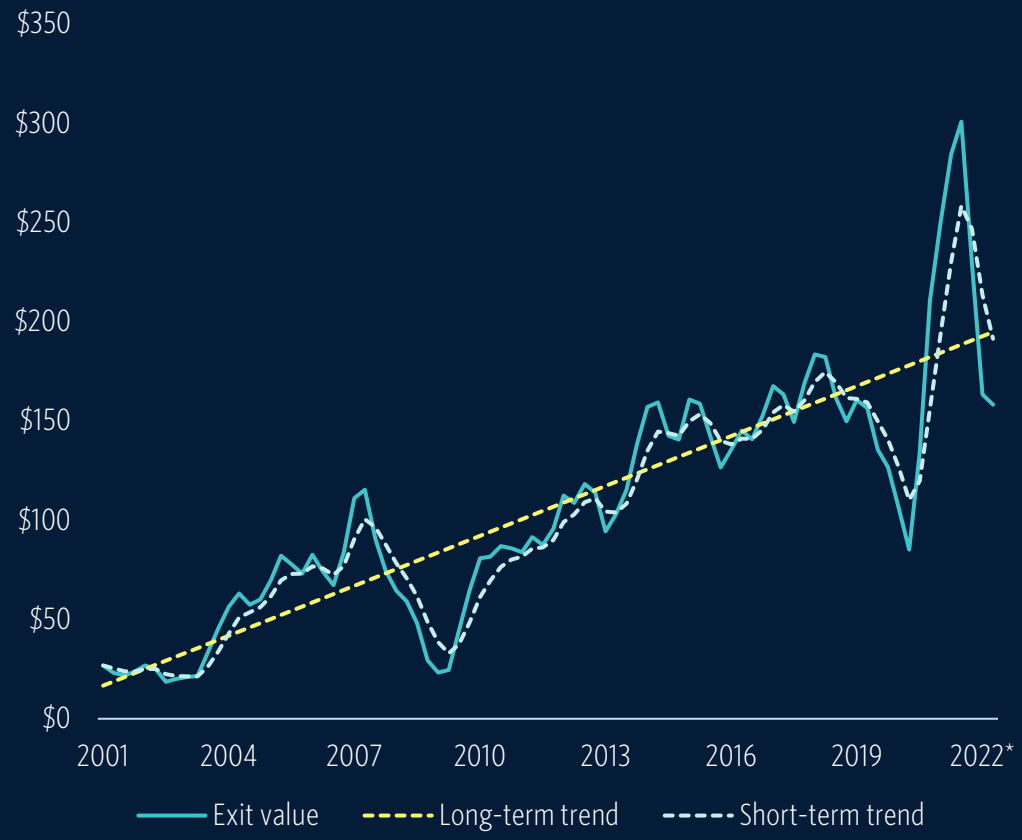
For information on forecast accuracy, see the Appendix.

Exit activity has fallen sharply below both short- and long-term trends.

Rolling six-month PE exit count trends



Rolling six-month PE exit value ($B) trends



Source: PitchBook | Geography: US
As of September 30, 2022
Note: Data is seasonally adjusted and includes estimates for the most recent four quarters.

Buyout exits have held up relatively well, while acquisitions have slowed, and public listings have almost completely vanished.

Trailing six-month PE exit trends dashboard*

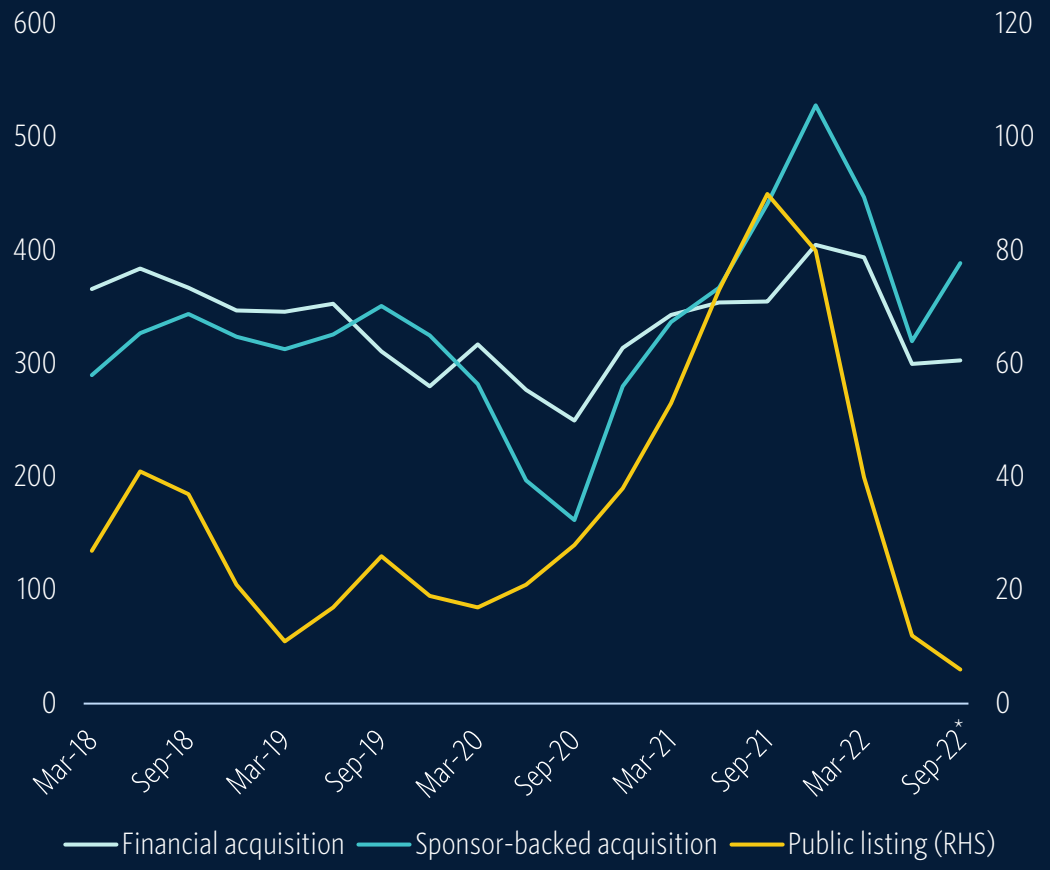
		Exit count				Exit value			
	Segment	Current	% of total	Long-term score	Short-term score	Current ($B)	% of total	Long-term score	Short-term score
	Total	708	100.0%	-0.93	-0.80	$158.4	100.0%	-1.18	-1.31
Sector	Business products & services	278	39.8%	-0.02	-0.38	$53.5	34.0%	-0.42	-0.86
Sector	Consumer products & services	100	14.3%	-2.16	-1.42	$19.6	12.5%	-1.92	-1.55
Sector	Energy	48	6.9%	-0.62	0.19	$18.7	11.9%	0.63	0.31
Sector	Financial services	32	4.6%	-2.64	-1.25	$9.8	6.3%	-1.92	-0.97
Sector	Healthcare	82	11.7%	-1.24	-1.48	$25.4	16.2%	-0.72	-1.35
Sector	Information technology	126	18.0%	-0.13	-0.53	$23.5	14.9%	-1.43	-1.25
Sector	Materials & resources	33	4.7%	0.43	1.01	$6.7	4.2%	-0.38	0.18
Type	Acquisition	303	43.4%	-1.97	-1.03	$78.3	49.8%	-0.73	-1.00
Type	Buyout	389	55.7%	0.33	-0.31	$76.7	48.8%	-0.51	-0.78
Type	Public listing	6	0.9%	-1.88	-2.85	$2.3	1.4%	-1.99	-2.39

Source: PitchBook | Geography: US
*As of September 30, 2022
Note: Data is seasonally adjusted and includes estimates for the most recent four quarters.

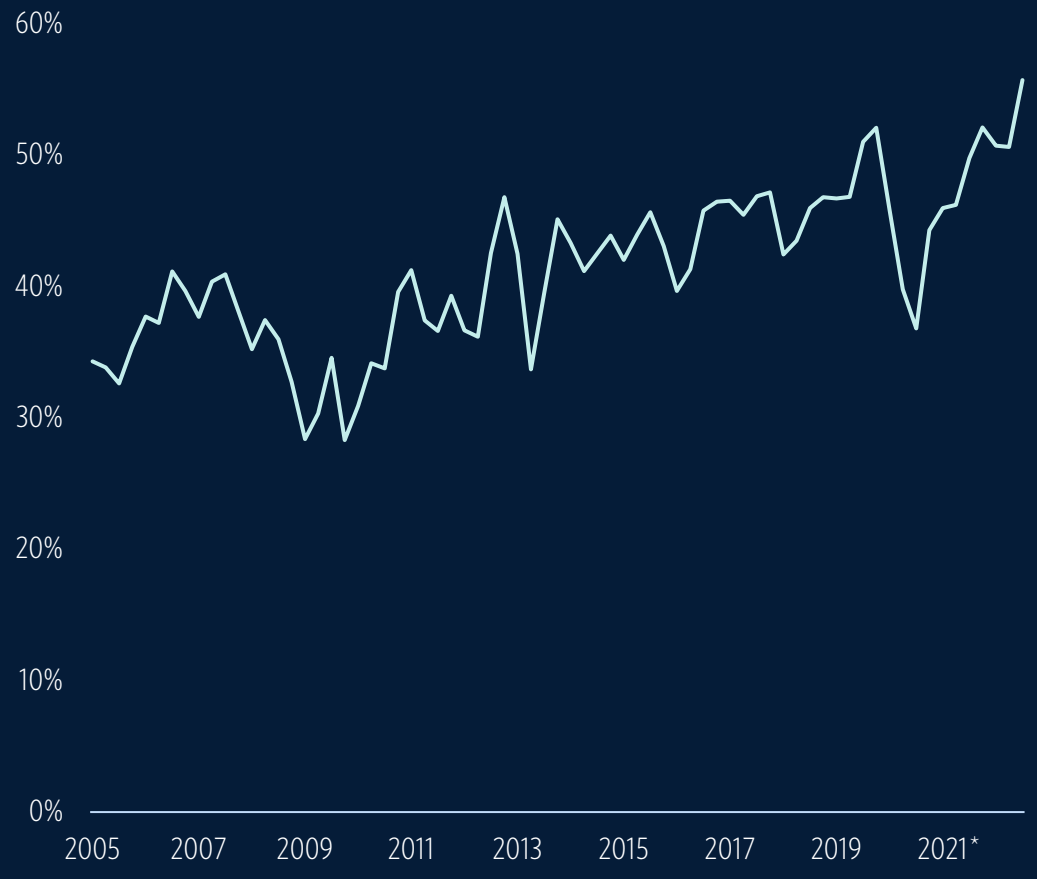
The PE exit trends dashboard provides a quantitative assessment of overall exit activity in the past six months, as well as within each sector and exit type after adjusting for seasonality and reporting lags. The long- and short-term scores represent z-score normalized deviations from a full-period linear trendline and a 12-month exponential moving average, respectively.

Sponsor-backed exits may continue to increase on a relative basis as GPs become the only motivated capital providers.

Rolling six-month PE exit count by type



Rolling six-month sponsor-backed acquisitions as a share of all PE exits

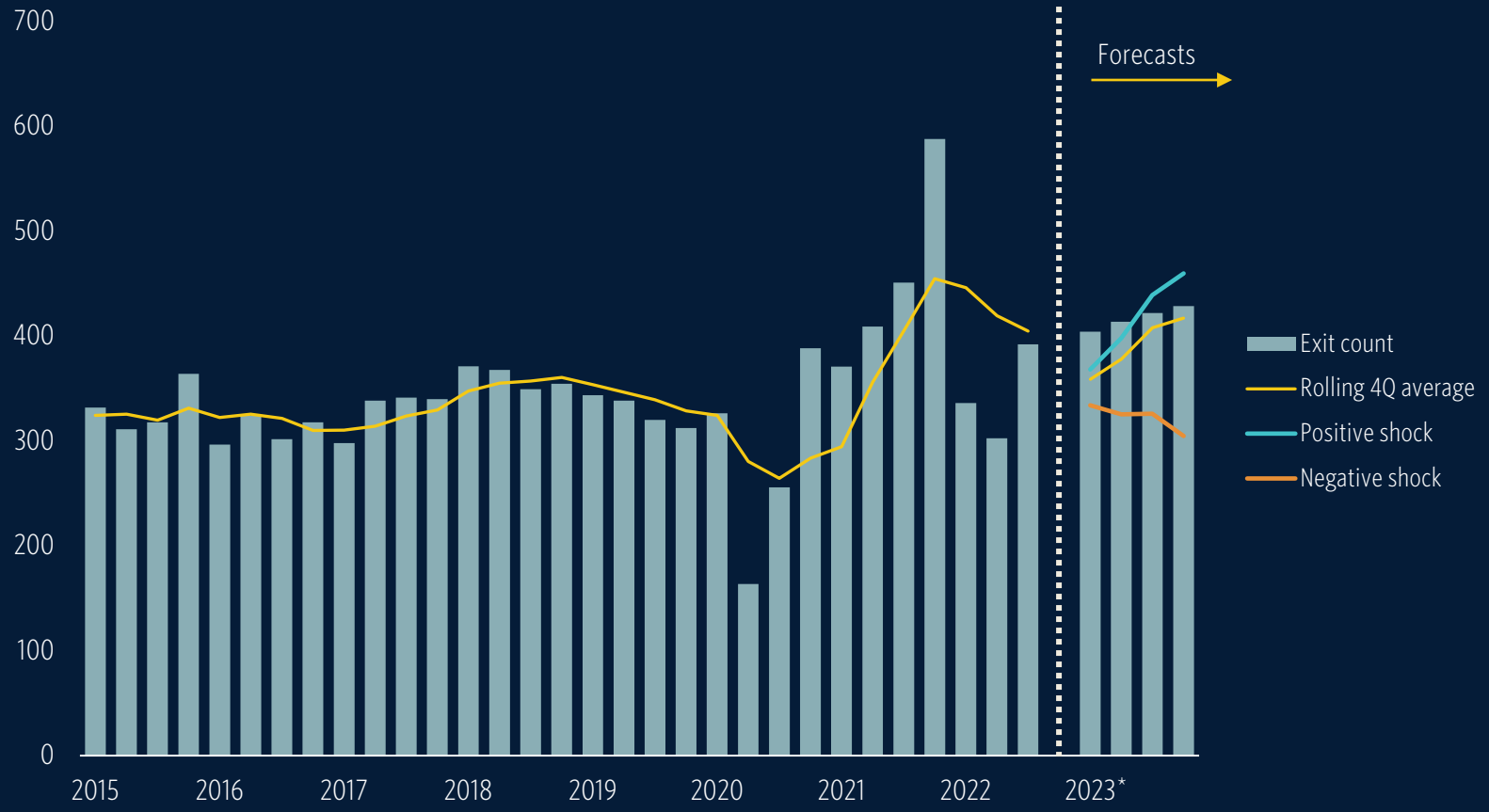


Source: PitchBook | Geography: US

*As of September 30, 2022

Based on trends and current market conditions, our quantitative model expects a slight bounce back in exit activity over the next year.

Quarterly PE exit count with year-ahead forecasts



Source: PitchBook | Geography: US

*As of September 30, 2022

The foundation of our exit activity model is a time series algorithm that fits a flexible linear trend to the historical data. We then overlay this with a regression model to adjust the trend prediction for market conditions, proxied by the high-yield credit spread, as well as lagged deviations from trend. Intuitively, higher high-yield spreads have been associated with below-trend exit activity.

Based on the current market conditions, the model predicts PE exit activity in the next four quarters to be about 3% higher than activity in the previous four quarters. In addition to the baseline forecast, we show forecasts for positive and negative shocks, defined as credit spreads instantaneously moving to 300 and 1,000 basis points, respectively, from the current level of 500 basis points.

For information on forecast accuracy, see the Appendix.

Portfolio impacts

Key takeaways

- Most traditional asset classes have performed poorly over the past year, especially fixed income when considering its historical risk profile and correlation with equities.
- A risk-balanced equity-bond portfolio has experienced its worst drawdown since the Great Depression, while the drawdown in equities has remained mild.
- One silver lining of higher interest rates is that they have pushed up expected returns across the risk curve. The implied (nominal) return on a traditional 60/40 portfolio of 7.3% is the most attractive it has been in more than 10 years.
- The drawdown in public market portfolios and lags in private market fund reporting have likely led many LP portfolios to become significantly overallocated to private markets.
- Allocators can anticipate lower-than-expected contributions and distributions from PE funds if public equity markets continue to perform poorly.
- Potential overallocations to private markets, as well as smaller net distributions coming back to LPs, will contribute to a challenging fundraising environment, particularly for smaller funds without a long track record.

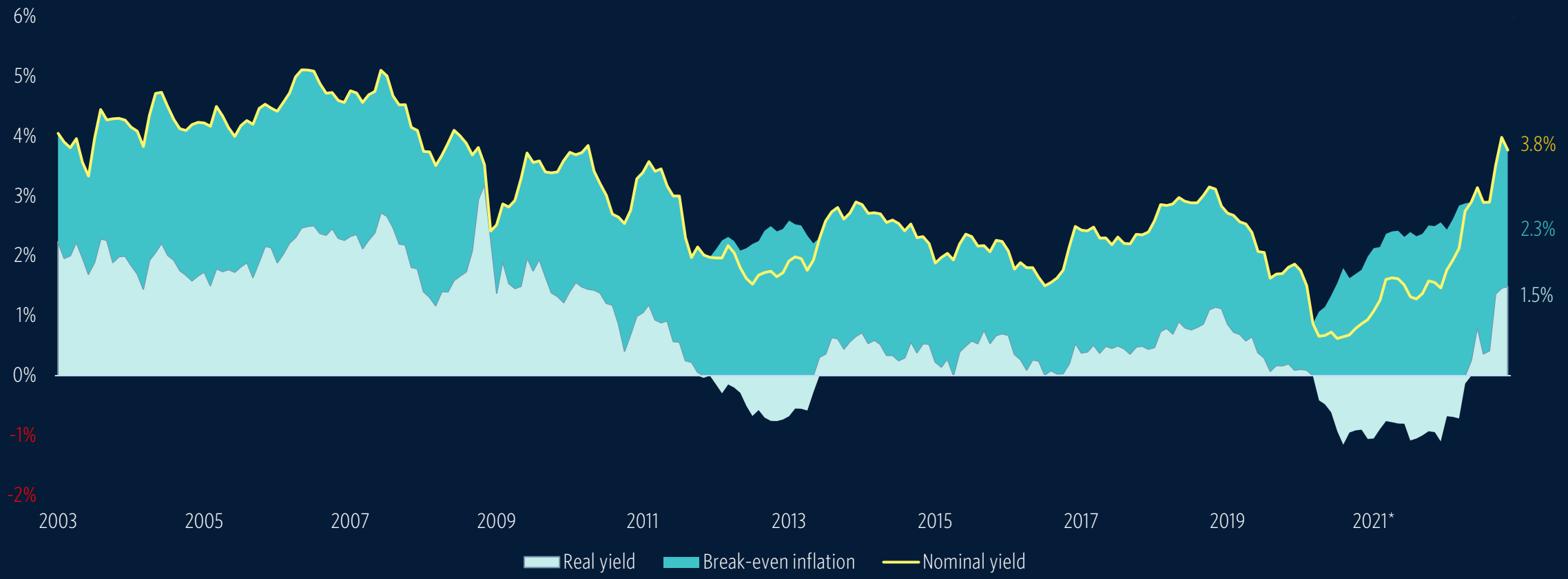
Driven by higher discount rates, most traditional asset classes have performed poorly over the past year, especially fixed income...

Select public market indexes (indexed to 100)

Source: Morningstar
*As of November 17, 2022

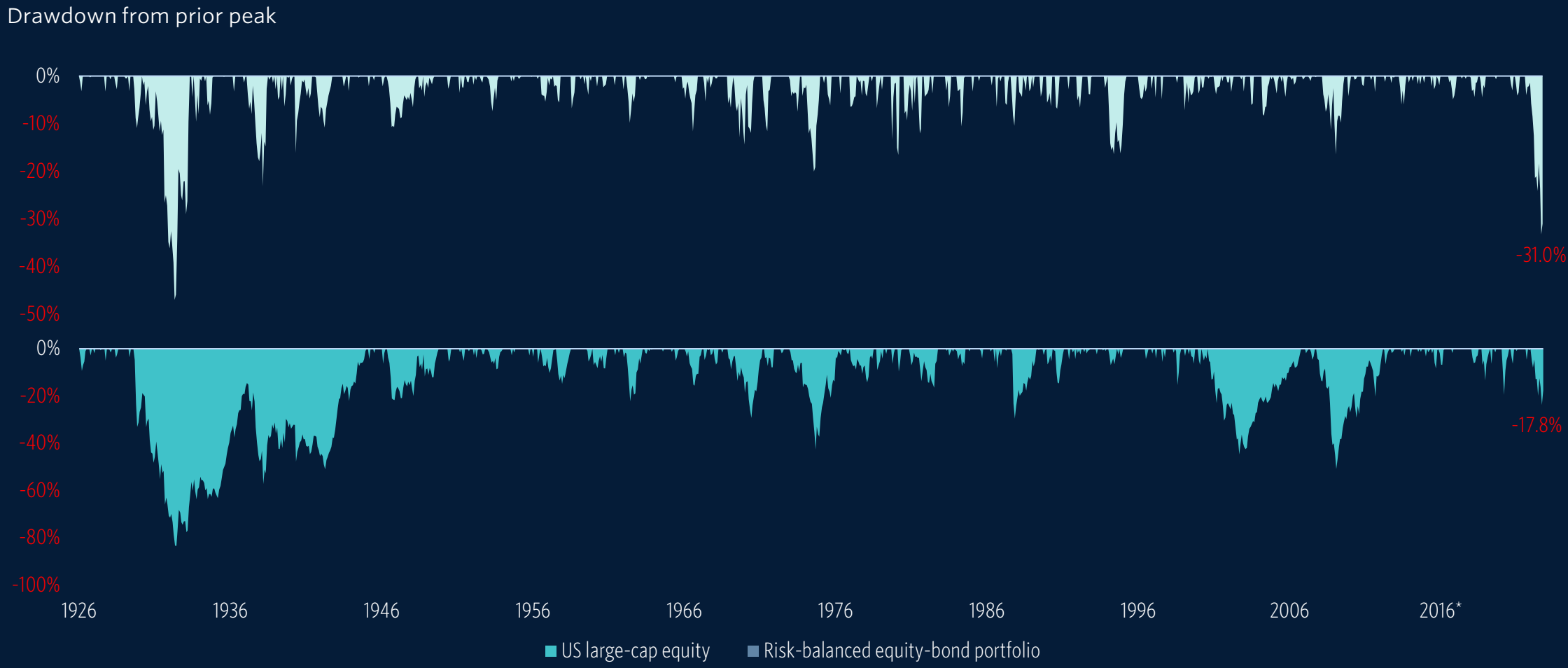
...as Treasury yields have fluctuated around cycle highs on the 10-year note, driven by a sharp increase in real yields...

10-year Treasury yield attribution



Source: FRED, PitchBook | Geography: US
*As of November 17, 2022

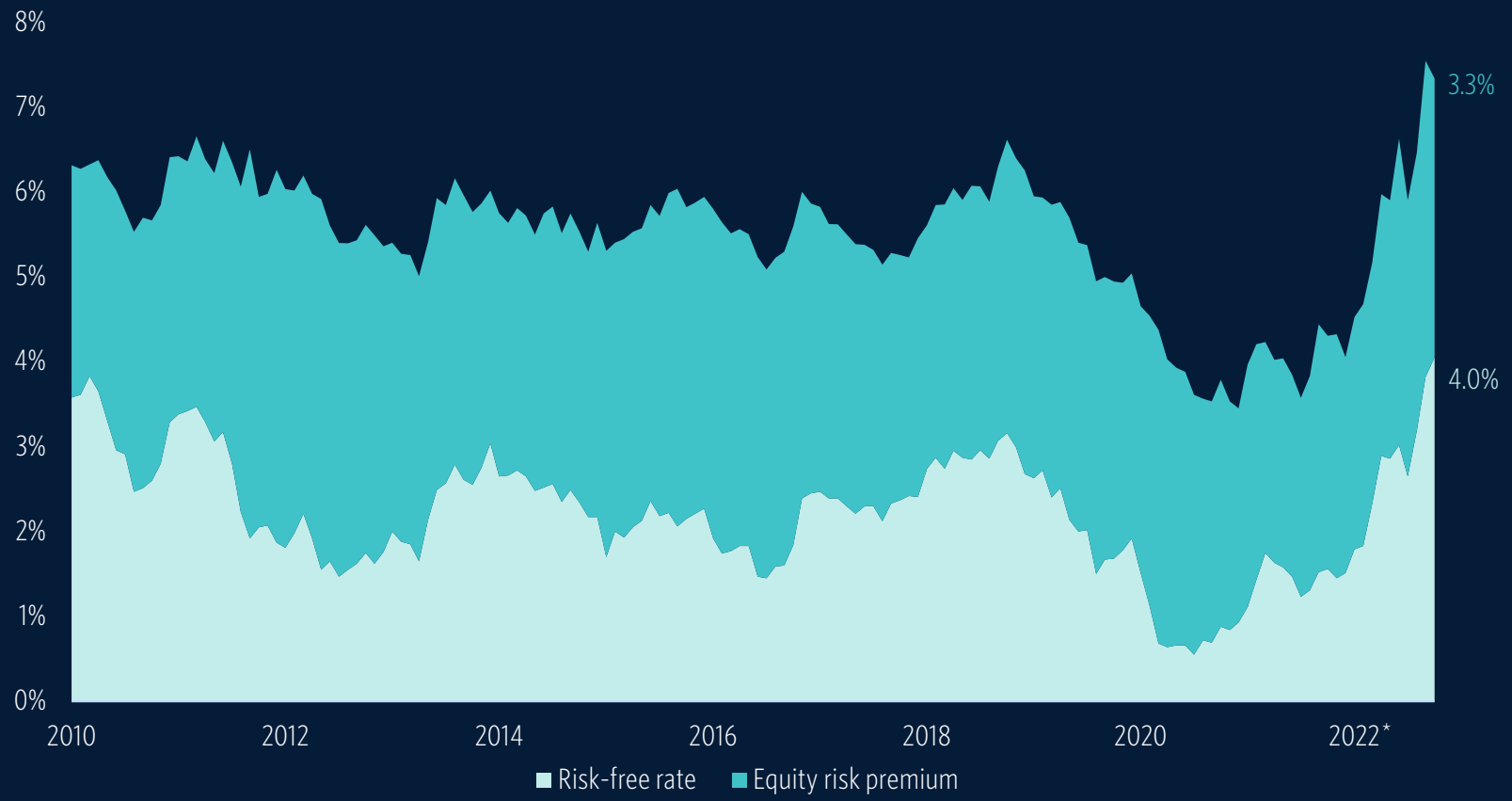
...which has resulted in the biggest drawdown in a risk-balanced equity-bond portfolio since the Great Depression despite a mild drawdown in equities.



Source: Ibbotson Associates, SBBI | Geography: US
*As of October 31, 2022
Note: The risk-balanced portfolio allocation is based on full period ex-post volatility. Drawdowns are calculated monthly.

The severe rise in risk-free yields has significantly lifted return expectations across the risk spectrum.

Contribution to the implied expected return of a 60/40 portfolio



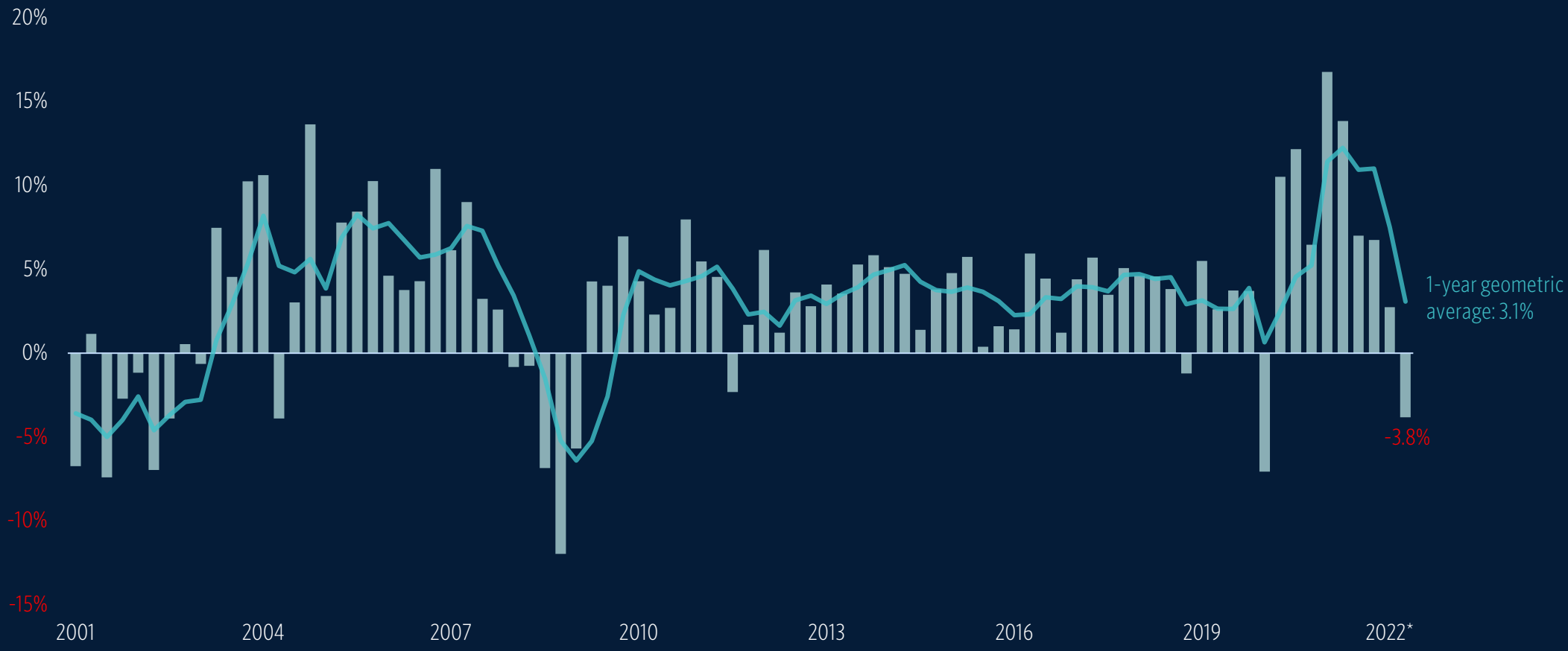
Source: Aswath Damodaran, PitchBook | Geography: US
*As of October 31, 2022
Note: The ERP is based on the S&P 500 and the risk-free rate is the 10-year Treasury yield.

The foundation of expected returns for every asset class is the risk-free interest rate, which is typically represented by Treasury note yields. Investors require a risk premium (that is, a higher expected return) for taking on any additional risk.

While the recent rise in Treasury yields may not hold, the current implied expected return on a traditional 60/40 portfolio has risen from 4.0% to 7.3% in the past 18 months, its most attractive level in more than 10 years. Just as extremely low interest rates and tight risk premiums in public equities pushed investors out on the risk curve to meet return requirements, the reverse, if sustained, will bring them back in.

PE funds started to mark down portfolio values in Q2 2022, but likely still have a long way to go given the record markups in late 2020 and 2021.

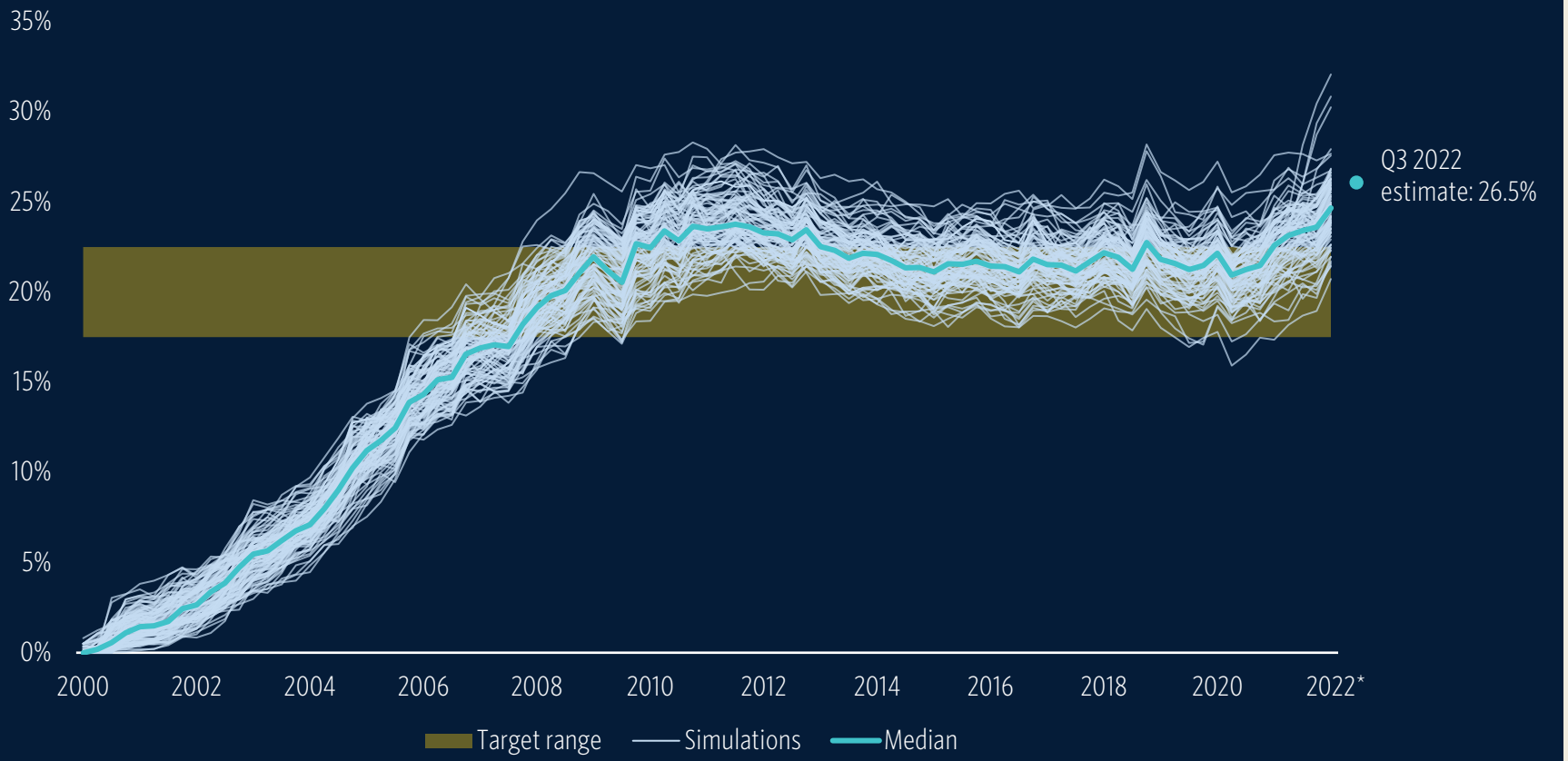
Quarterly PE fund performance



Source: PitchBook | Geography: US
*As of June 30, 2022
Note: The Q2 2022 figure is preliminary.

The sharp drawdown in equity and bonds and lagged private market fund reporting have caused relative allocations to private markets to surge...

Simulated PE allocation of a 60/40 portfolio with a 20% overall target to PE and a fixed commitment schedule incepted in 2000



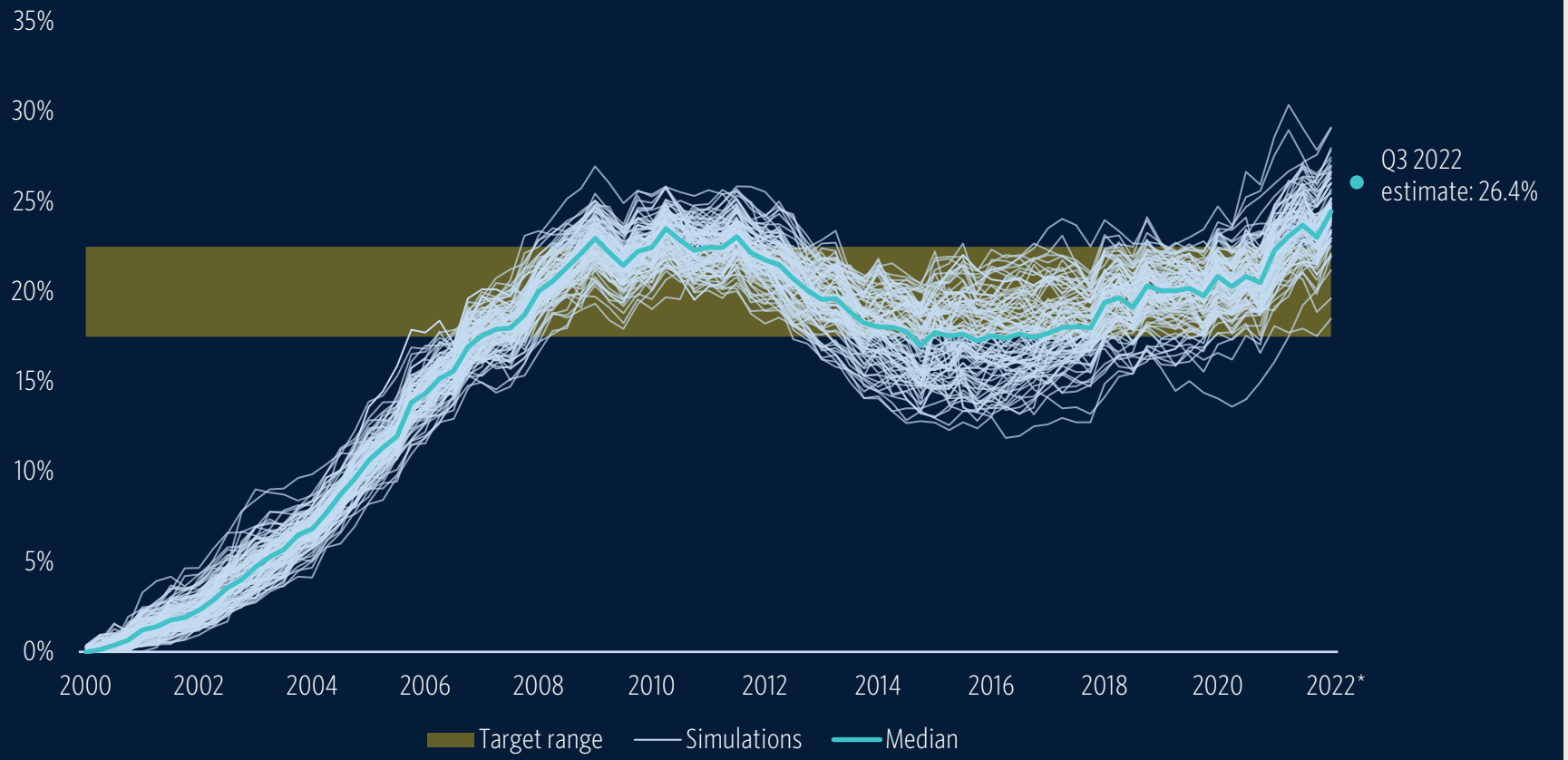
Source: PItchBook | Geography: US
*As of March 31, 2022
Note: For illustrative purposes only

We simulated a simple multi-asset portfolio targeting 40% public equity (Russell 3000), 20% PE (buyout), and 40% fixed income (Bloomberg US Agg) to estimate the impact of recent market movements on LPs' relative allocation to PE. In each simulation run, four random buyout funds are added to the portfolio at the end of every year with a commitment size of 30% of total portfolio value during a seven-year ramp period and 18% thereafter.

The simulation results suggest that LPs are extremely overallocated to PE at the end of Q3 2022, with the median portfolio a net 6.5% overweight. This will likely contribute to a difficult fundraising environment in the coming quarters.

...but allocators should recognize that pulling back from planned commitments may lead to undesirable swings in private allocations.

Simulated PE allocation of a 60/40 portfolio with a 20% overall target to PE and a tactical commitment schedule incepted in 2000



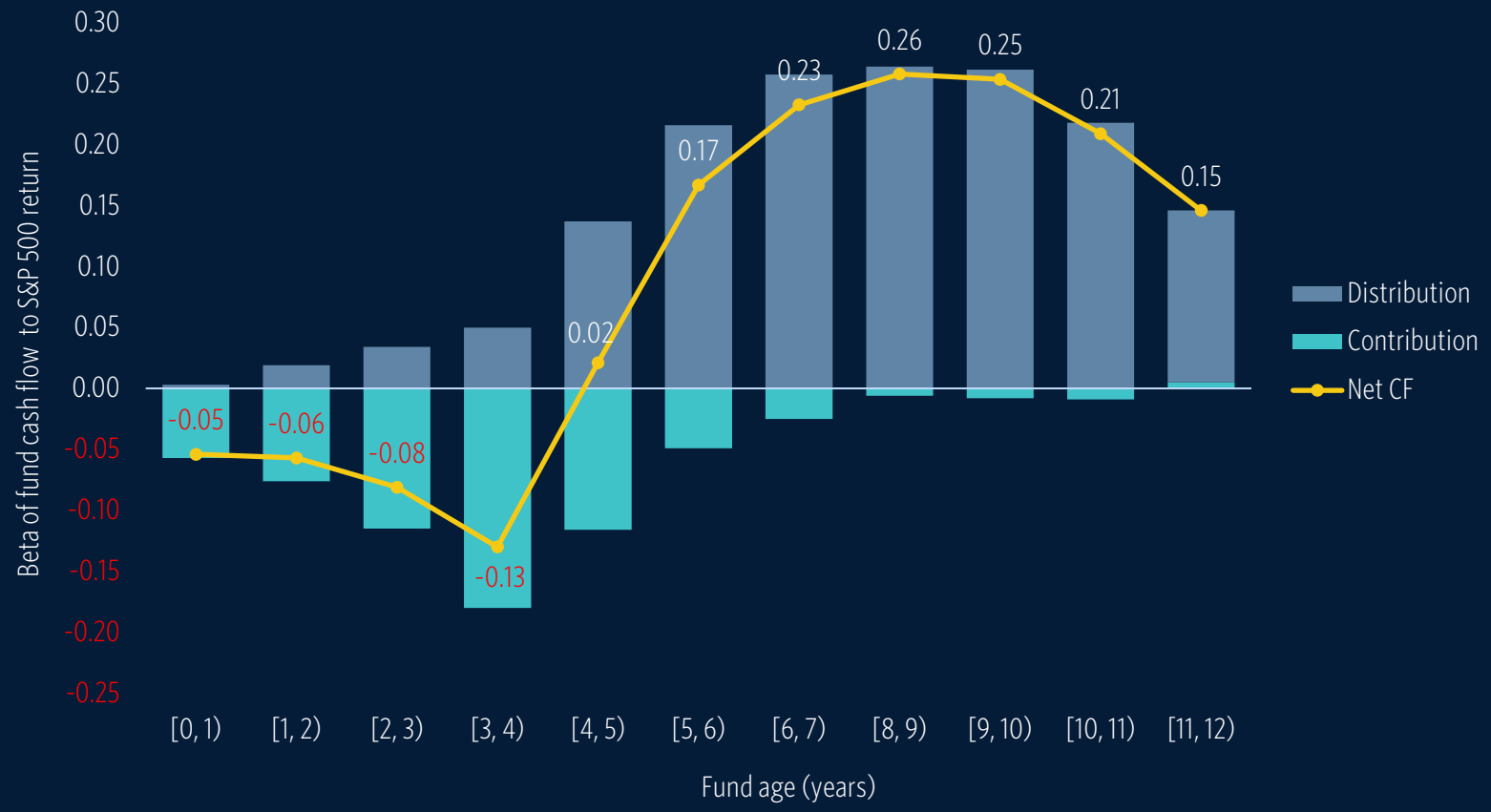
Source: PItchBook | Geography: US
*As of March 31, 2022
Note: For illustrative purposes only

We tweaked the simulation described on the previous page to include a tactical element in the commitment schedule after the ramp period. When the portfolio is more than 2.5% overallocated to PE, the commitment size is 0%, and when the portfolio is more than 2.5% underallocated to PE, the commitment size returns to the ramp period value of 30%. This strategy led to more volatility and larger swings in relative allocations.

Outside of secondary sales, allocators have a limited ability to immediately reduce allocations to private markets. Additionally, it is important to remember that one of the biggest drivers of this effect is lack of mark-to-market pricing in private market funds, making relative allocations appear more extreme than they likely are.

Both contributions and distributions are positively correlated with public equity performance, but distributions are more sensitive...

Sensitivity of PE buyout fund cash flows to public equity performance by fund age



Source: PitchBook | Geography: US

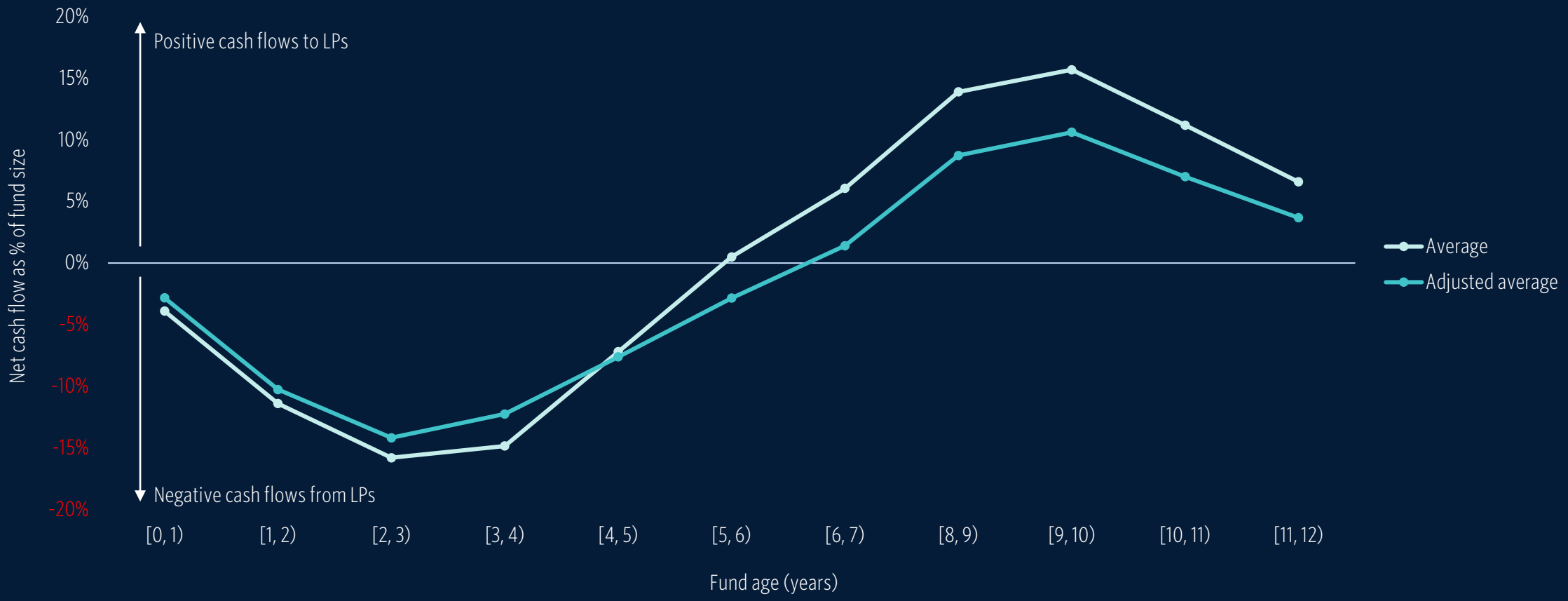
Note: Fund cash flows are normalized for fund size. Contributions are treated as negative values.

We used a regression model and our historical fund cash flow data to estimate the beta of annual fund cash flows to the performance of the S&P 500 Index by fund age. This can be used to estimate how net cash flows are expected to change based on what has happened in public equity markets.

For example, consider a fund in its eighth year when the S&P 500 declined by 20%. The average annual cash flow for this fund has been 14% of fund size. However, given an estimated beta of 0.26 and a 20% market decline, we would expect the annual net cash flow to be only 9% of fund size, a nominal decrease of nearly 40%.

...leading to a downward shift in the average expected net cash flow profile for funds older than five years, which could potentially exacerbate allocation issues...

Average PE buyout fund cash flow profile

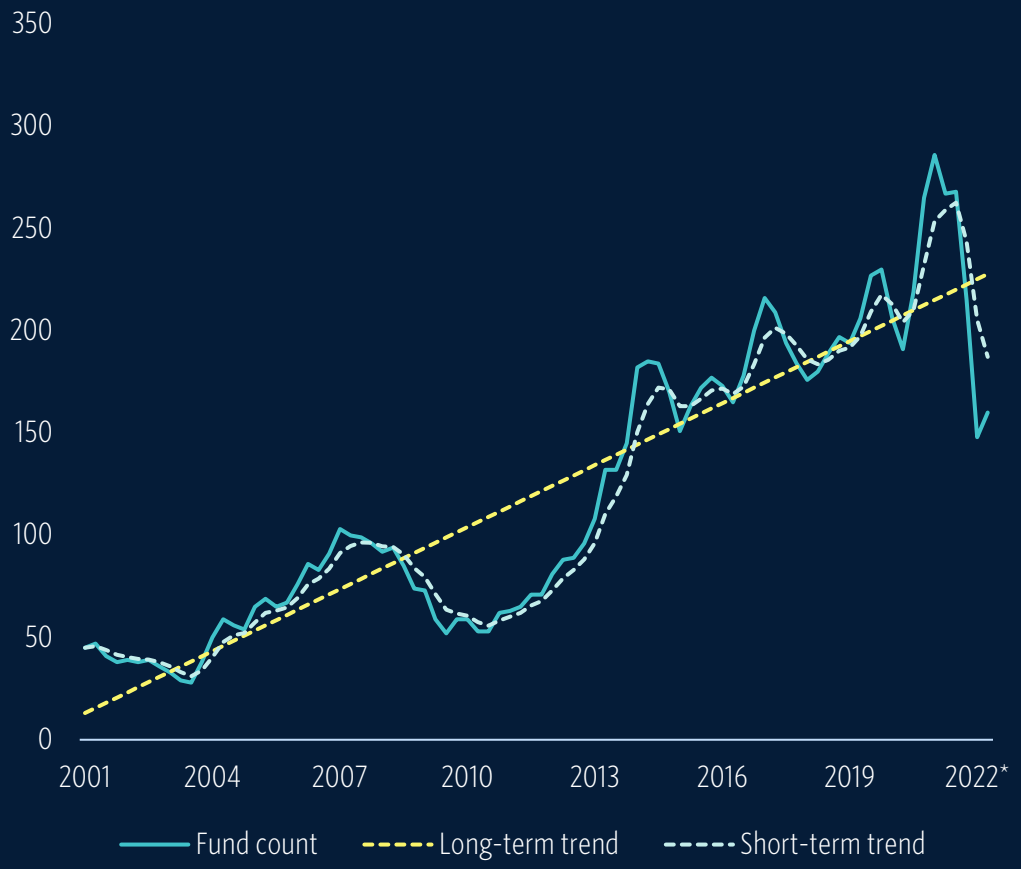


Source: PitchBook | Geography: US

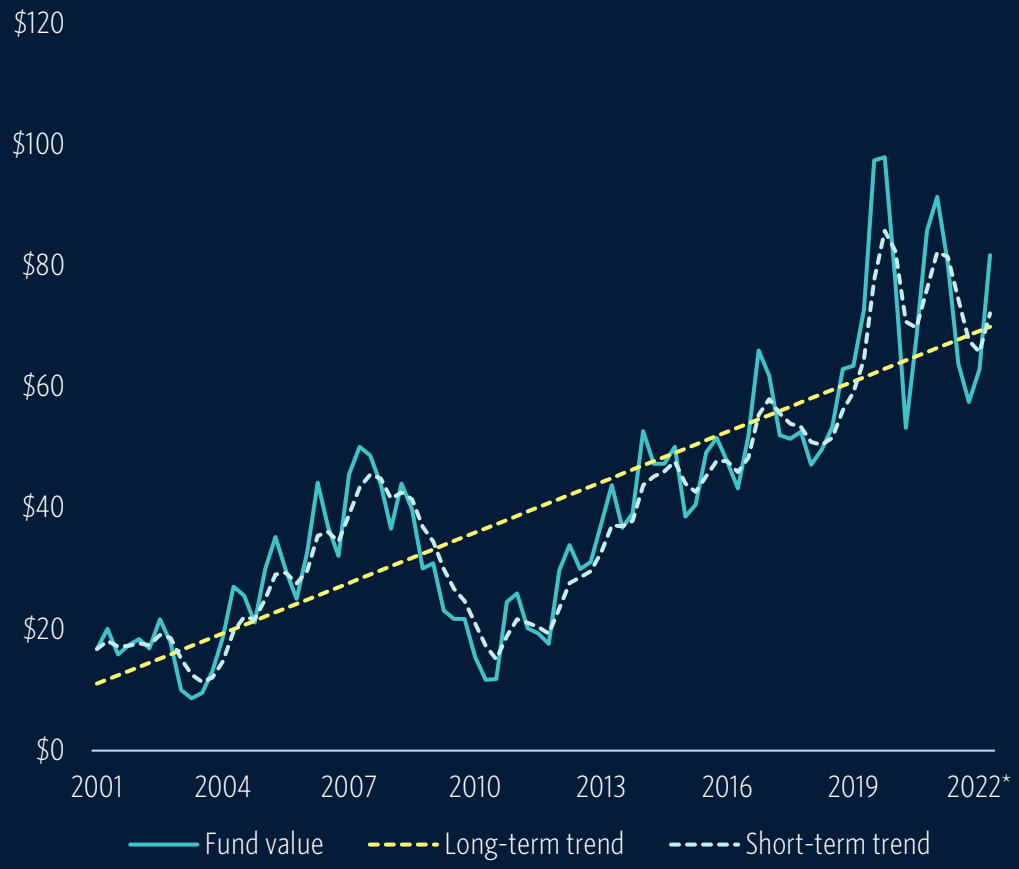
Note: The adjusted average net cash flow profile is based on the betas on the previous page and assumes a 20% market decline

...which will likely contribute to difficult fundraising environment, especially for smaller funds and strategies without a long track record.

Rolling six-month buyout fund count trends



Rolling six-month buyout fund value ($B) trends



Source: PitchBook | Geography: US
*As of September 30, 2022

Appendix

High inflation, low unemployment, and increases in short-term interest rates drive the recession prediction.

Contributions to recession prediction*

	Feature	Normalized importance	Value	Normalized value	Contribution to recession probability
Economic	Inflation (CPI, YoY%)	0.81	8.2%	1.54	14.5%
	Unemployment rate (level)	0.41	3.5%	-1.35	12.6%
	Corporate debt (YoY %)	0.36	8.4%	-0.55	4.4%
	Real oil price (level)	0.68	NM	1.24	2.1%
	Building permits (YoY %)	0.11	-1.5%	-0.23	1.2%
	Corporate profit margins (net YoY)	0.05	0.0%	-0.33	0.5%
	GDP (% relative to trend)	0.20	0.6%	-0.03	0.0%
	Consumer confidence (net YoY)	0.12	-2.8	-2.47	0.0%
	Unemployment rate (net YoY)	0.01	-1.2%	-0.83	-1.2%
	Months since last recession	1.00	30	-0.34	-1.3%
	Household debt (YoY%)	0.50	7.3%	-0.07	-3.1%
Market	3-month Treasury bill (net YoY)	0.81	3.7%	2.25	14.9%
	Corporate credit spread (net YoY)	0.08	0.3%	0.46	1.0%
	Corporate credit spread (level)	0.13	1.7%	-0.06	1.0%
	Yield curve spread (net YoY)	0.30	0.3%	0.28	-0.2%
	Stock prices (YoY)	0.00	-16.0%	-1.53	-0.8%
	Yield curve spread (level)	0.96	1.1%	0.00	-1.1%

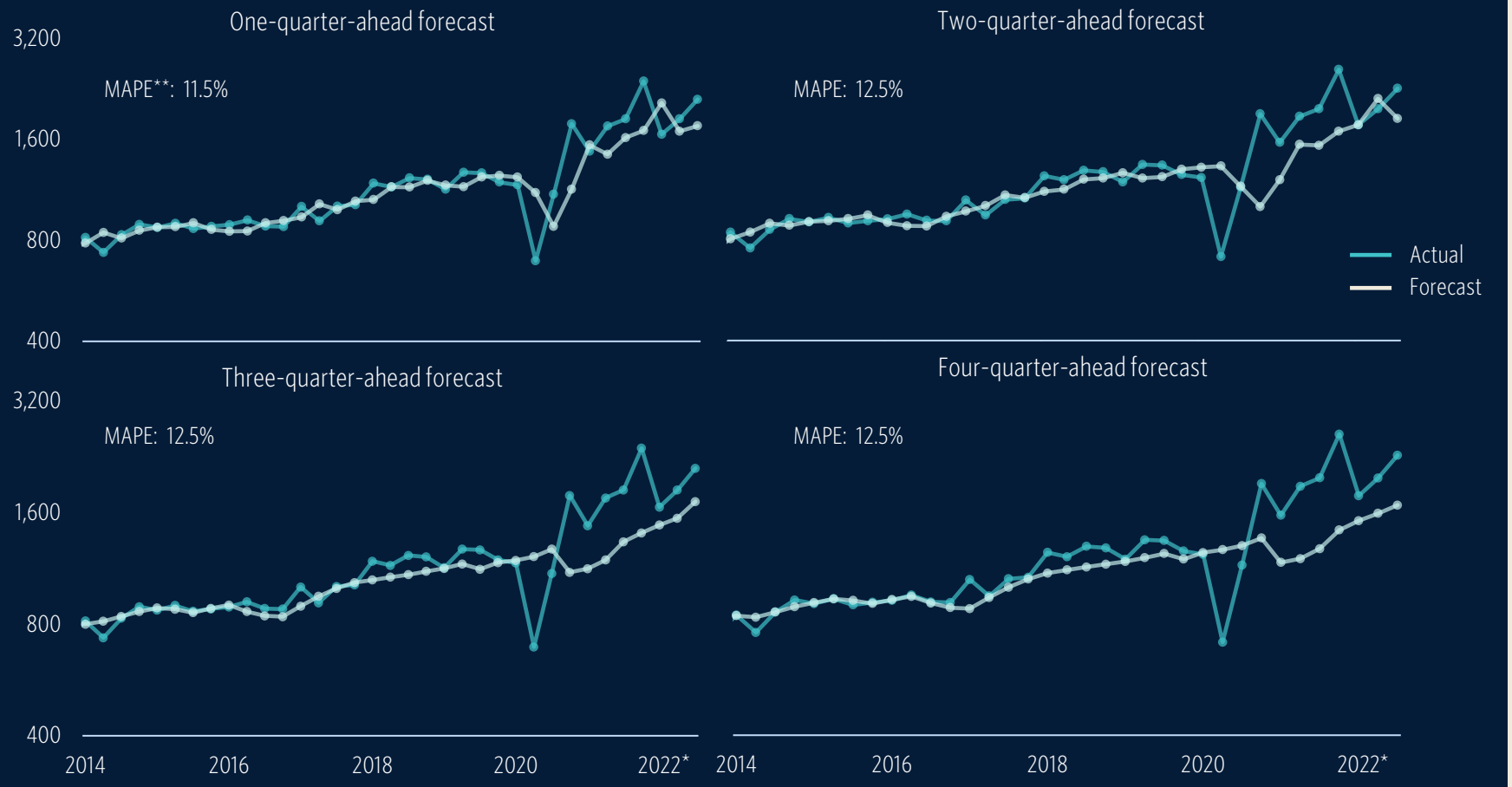
Source: PitchBook | Geography: US
*As of October 31, 2022 or latest available

Our recession model considers 17 macro and market variables to determine the probability that a recession will occur at any point during the next 18 months.

The model was trained on data going back to 1965, and out-of-sample predictions were made each month starting in 1975. The backtested out-of-sample accuracy was around 90%.

The quality of forecasts has been good in normal times for all time horizons but deteriorated in volatile market conditions.

Out-of-sample buyout deal count forecasts versus actual values by forecast horizon

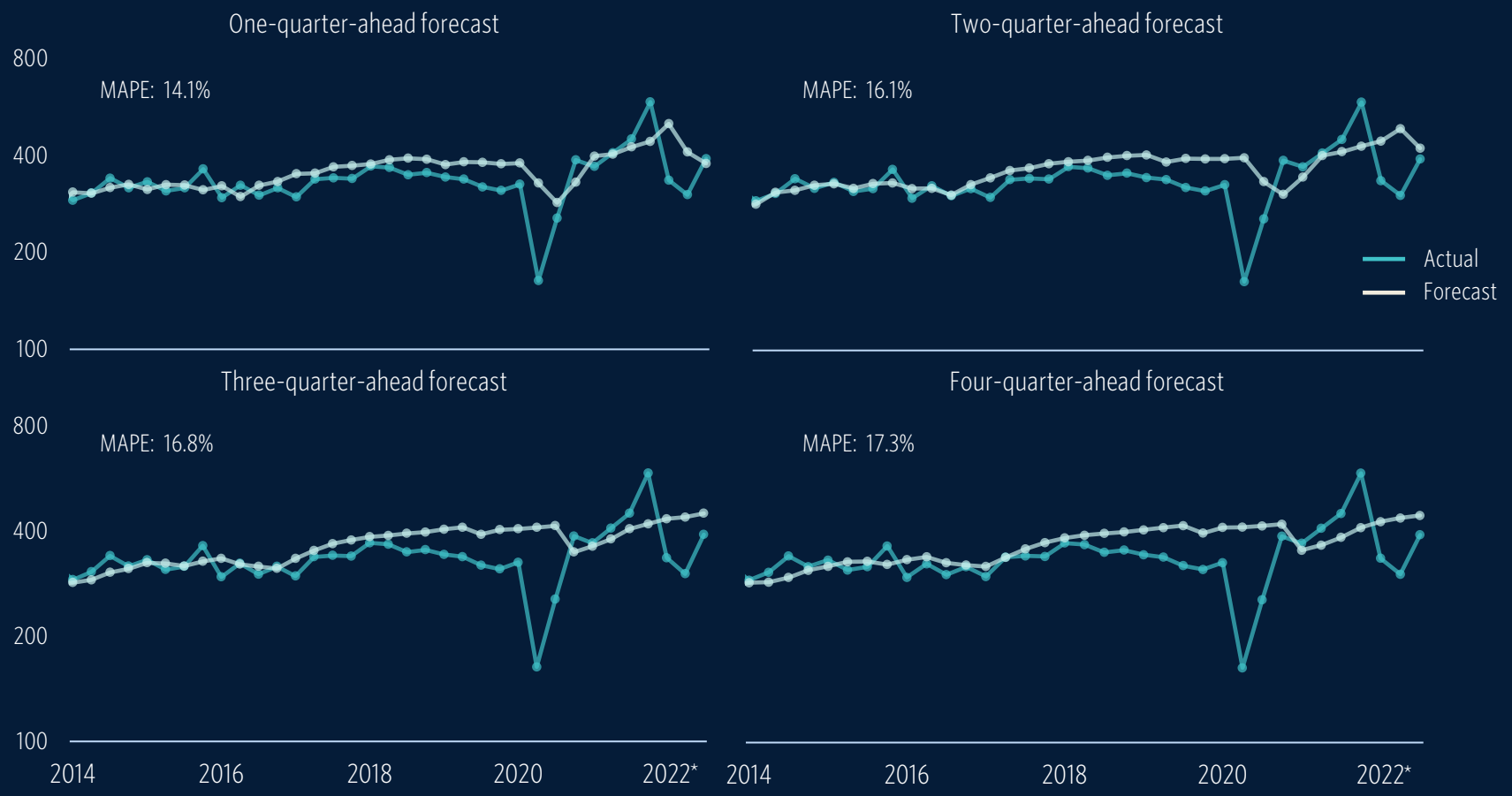


Source: PitchBook | Geography: US
*As of September 30, 2022
**Mean absolute percentage error between deal count forecasts and actual deal count

To validate forecast accuracy, we trained the model on 10 years of buyout deal data beginning in 2004. Then, at the end of each quarter, we made a deal count forecast for each of the upcoming four quarters based on the current linear trend, trailing buyout activity relative to trend, and current high-yield credit spreads.

Exits have been more difficult to predict than deals.

Out-of-sample exit count forecasts versus actual values by forecast horizon



Source: PitchBook | Geography: US

*As of September 30, 2022

To validate forecast accuracy, we trained the model on 10 years of PE exit data beginning in 2004. Then, at the end of each quarter, we made an exit count forecast for each of the upcoming four quarters based on the current linear trend, trailing buyout activity relative to trend, and current high-yield credit spreads.

Glossary

Trimmed mean CPI (page 9) – a measure of core CPI from the Cleveland Fed that is a weighted average of one-month inflation rates of components whose expenditure weights fall below the 92nd percentile and above the 8th percentile of price changes. By omitting outliers and focusing on the interior of the distribution of price changes, the Trimmed Mean CPI can provide a better signal of the underlying inflation trend.

Median CPI (page 9) – a measure of core CPI from the Cleveland Fed that is the one-month inflation rate of the component whose expenditure weight is in the 50th percentile of price changes. By omitting outliers and focusing on the interior of the distribution of price changes, the Median CPI can provide a better signal of the underlying inflation trend.

Expected inflation term structure (page 9) – an estimate of the expected average CPI rate of inflation over each time horizon from the Cleveland Fed. The estimates are calculated with a model that uses Treasury yields, inflation data, inflation swaps, and survey-based measures of inflation expectations.

Median wage (page 11) – a measure of the nominal wage growth of individuals from the Atlanta Fed that is constructed using microdata from the Current Population Survey and is the median percent change in the hourly wage of individuals observed 12 months apart.

Senior Loan Officer Survey (page 16) – quarterly survey conducted by the Federal Reserve of up to 80 large domestic banks and 24 US branches and agencies of foreign banks. Survey questions cover changes in standards and terms of banks' lending and the state of business and household demand for loans.

Secured Overnight Financing Rate (SOFR, page 21) – a broad measure of the cost of borrowing cash overnight collateralized by Treasury securities. It is the standard reference rate used for floating-rate debt securities, including leveraged loans.

Break-even inflation (page 33) – the difference between a nominal Treasury yield and the yield on a Treasury Inflation-Protected Security (TIPS) of the same maturity, which can be interpreted as the market's expectation for the average inflation rate over the maturity time horizon.

Risk-balanced equity-bond portfolio (page 34) – a hypothetical portfolio that applies leverage to a Treasury portfolio such that the portfolio risk contribution from equities and bonds are equal. The leverage is constant and calculated using ex-post volatility.

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