INVESTMENTS
& WEALTH MONITOR

A reprinted article from September/October 2021

When Diversification Fails

By Sébastien Page, CFA®

INVESTMENTS & WEALTH INSTITUTE®

When Diversification Fails

By Sébastien Page, CFA®

Editor's note: This article summarizes the key concepts from Beyond Diversification: What Every Investor Needs to Know About Asset Allocation *(McGraw Hill, 2020) by Sébastien Page. It is reprinted with permission of McGraw-Hill © 2021. The views expressed in this article are those of the author and do not necessarily reflect the views of T. Rowe Price. Further information can be found at the end of this article.*

The best investment advice that could fit in a fortune cookie is probably to "diversify and stay invested for the long run." But one of the most vexing problems in investment management is that diversification seems to disappear when investors need it the most. Of course, the statement that "all correlations go to one in a crisis" is both an oversimplification and an exaggeration. But it has been well documented that correlations tend to increase in down markets, especially during crashes, i.e., left-tail events (Page and Panariello 2018). Studies have shown this effect to be pervasive for a large variety of financial assets, including individual stocks, country equity markets, global equity industries, hedge funds, currencies, and international bond markets.

Not only do correlations increase on the downside, but as shown in figure 1 they also significantly decrease on the upside. This asymmetry is the opposite of what investors want. Indeed, who wants diversification on the upside? Upside unification, i.e., antidiversification, would be preferable. During good times, we should seek to reduce the return drag from diversifiers.

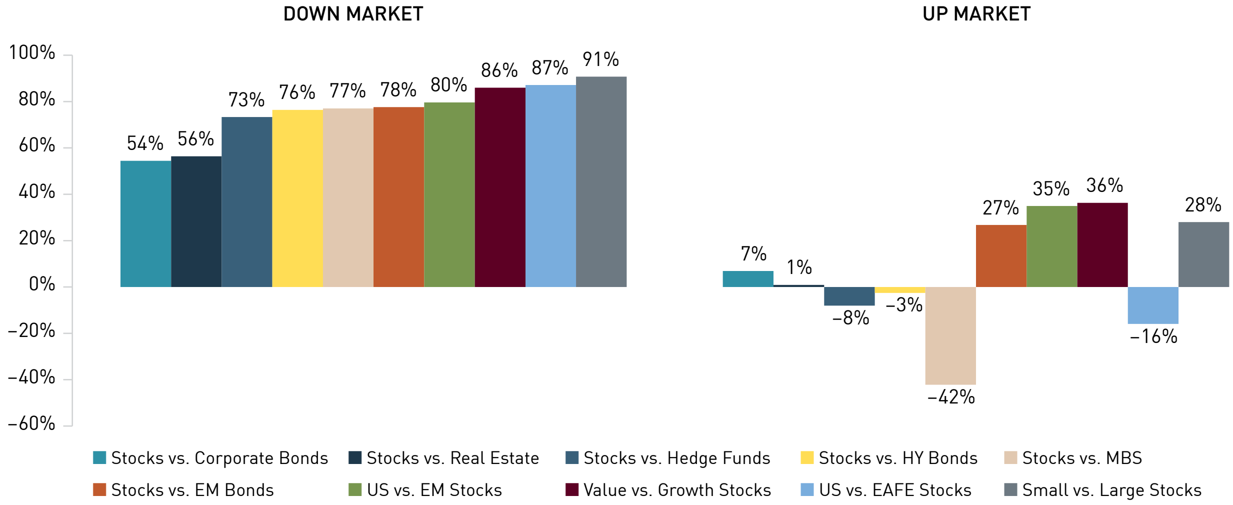
Many investors still do not fully appreciate the impact of correlation asymmetries on portfolio efficiency—in particular, on exposure to loss. Those who rely on average diversification and correlations are like the statistician who had his head in the oven and his feet in the freezer and suddenly exclaimed, "On average, I feel great!" During left-tail events, diversified portfolios may have even greater exposure to loss than more concentrated portfolios. Leibowitz and Bova (2009) show that during the 2008 Global Financial Crisis, a portfolio diversified across U.S. stocks, U.S. bonds, international stocks, emerging market stocks, and real estate investment trusts saw its equity beta rise from 0.65 to 0.95, and the portfolio unexpectedly underperformed a simple 60-percent U.S. stocks/40-percent U.S. bonds portfolio by 9 percentage points. Similar effects were observed during the crisis of 2020.

In that context, asset allocators must do more than simply "diversify and stay invested for the long run." Financial

Figure 1

WHEN DIVERSIFICATION FAILS

Correlations for key asset classses

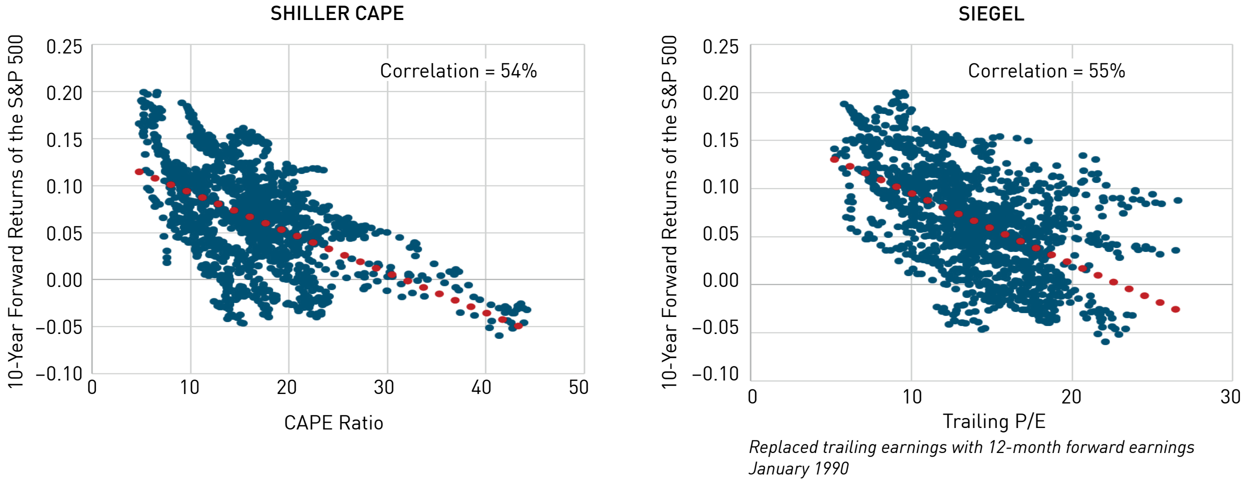


Source: Page and Panariello (2018). Data is monthly as of June 2017, with start dates based on availability; start dates and data sources can be found in Page and Panariello (2018). Left-tail and right-tail correlations are at the 1st and 99th percentiles but are adjusted using the data-augmentation methodology. Full correlation profiles (adjusted, unadjusted, and normal) are shown in the paper.

Sources: MSCI, Russell, Bloomberg Index Services Limited, NAREIT, and HFRI (see the end of this article)

Figure 2

SAA EQUITY FORECAST



Replaced trailing earnings with 12-month forward earnings January 1990

Past performance is not a reliable indicator of future performance.

For the period January 1881, through March 2021. Figures calculated in U.S. dollars.

Source: Robert Shiller dataset, eon.yale.edu/~shiller/data.htm

planning and investing require more than fortune-cookie advice. Investment professionals and do-it-yourself individuals who are willing to raise their game must take a journey into return forecasting, risk forecasting, and portfolio construction. To do so, investment theory is quite useful. The models are not perfect (if only it were so simple), but they can improve the quality of the decision-making process. Quantitative analysis adds value, but it is not a substitute for judgment.

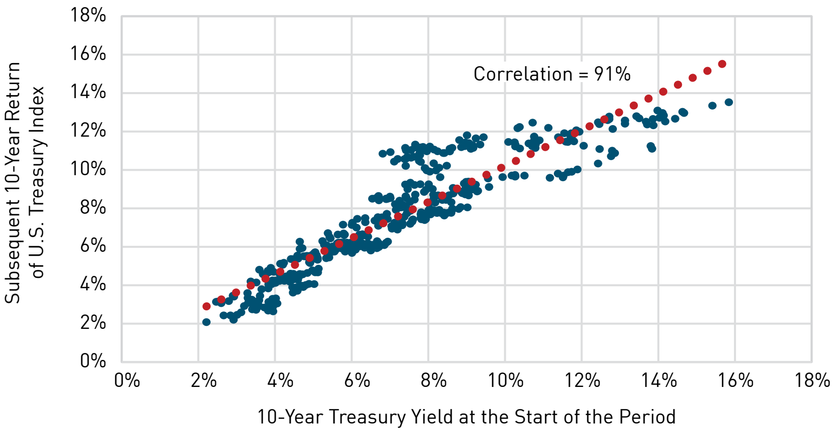
On return forecasting for relatively long horizons, modern finance helps assess the impact of low rates on expected returns. The same framework also suggests that risk-proportional returns and market-capitalization weights can provide useful reference points around which to debate future returns. Given current conditions, with extraordinary low rates, investors may need to lower their expectations. Figures 2 and 3 show that it matters what we pay for financial assets. Higher valuations, i.e., price-to-earnings ratios or yields on bonds, tend to lead to lower subsequent long-term return, and when markets are cheap, generally it's a good time to buy.

These valuation-based expected return models point to lower returns over the next five to 10 years. However, if we express expected returns for equity asset classes as dividend yield, plus long-term growth and valuation change, the numbers are somewhat more optimistic. In that context, it may be prudent to use a few different models and incorporate a good dose of judgment. On the bond side, simple valuation-based models—even those that simply rely on yield-to-maturity—tend to be remarkably predictive.

The average return for the S&P 500 over the 30 years ending March 3, 2021, has been 10.3 percent. For bonds, as measured by the Bloomberg Barclays Aggregate U.S. Bond Index, it has been 5.7 percent. With such high returns, it could have been possible to achieve a 6-percent performance target, e.g., in a passive portfolio, with only a 6.5-percent allocation to stocks. My back-of-the-envelope estimates, based on the above relationships and given current valuations, is that to potentially generate 6 percent going forward, one would need to invest 85 percent in stocks.[1] Over the next few years, we'll hear of the search

Figure 3

U.S. 10-YEAR TREASURY BOND YIELD VS. SUBSEQUENT 10-YEAR RETURN OF U.S. TREASURY



Past performance is not a reliable indicator of future performance.

For the period January 31, 1973, through July 30, 2010. Figures calculated in U.S. dollars.

Source: Bloomberg Finance L.P.

for yield and the search for returns. Low rates and high valuations indeed push investors up the risk curve over time. Otherwise, as a stoic would say, "The secret to happiness in life is to lower your expectations."

As for shorter-term return forecasts, valuation ratios and momentum can be useful but offer relatively limited predictability except for relative yields across fixed income asset classes, which work well. In a tactical asset allocation context, valuation, fundamentals, and macro factors can be combined through a discretionary framework, in which experienced investors play a key role. For such a process, dashboards provide rigor, and they help filter and organize data in a way that generates trade ideas.

Here are my rules of thumb for return forecasting:

Long-term forecasts

- When in doubt, assume that returns will be proportional to risk, i.e., beta. Free lunches are rare.
- For stocks, check that your estimate is not too far from the inverse of the price-to-earnings (P/E) ratio plus inflation.
- For earnings, i.e., the "E" in P/E, don't rely on optimistic, short-run, or noisy sell-side estimates.
- For more flexibility, break down returns into two building blocks: income and long-term growth.
- Valuation changes are harder to model. When in doubt, assume valuation ratios revert to a mean.
- For bonds, make sure your estimate is not too far from the asset class's yield-to-maturity.
- Beware of large credit and currency risk exposures. Apply a default haircut when needed.
- If possible, ask experienced investors for their forecasts of earnings growth, rates, spreads, etc.
- Use these forecasts as the key inputs to transparent building-block models that can be debated.

Tactical forecasts

- For shorter-term equity forecasts, focus on valuation changes more than on income and growth.
- Use valuation ratios (P/E, price-to-cash flow [P/CF], price-to-book [P/B]) to evaluate whether an asset class is cheap or expensive.
- Pay close attention to P/CF for relative bets, and to P/E for absolute (market timing) decisions.
- Use six- and 12-month momentum as secondary factors, to better time valuation-based trades.
- With macro factors, account for current conditions and how macro factors affect asset prices.
- Don't blindly assume that rising rates are bad for risk assets such as stocks and credit bonds.
- When fundamentals such as margins reach extreme levels, assume they might revert to a mean.
- For bonds, use yield-to-maturity ratios to forecast one-year relative returns between asset classes.
- Don't expect return momentum to work in bond markets, except weakly in the very short run.

Two general rules of thumb

- Use data and models to estimate factor relationships, assess signal quality, and remove biases.
- Use judgment to account for current conditions across monetary, fiscal, and geopolitical factors.

On risk forecasting, the good news is that volatility seems fairly predictable, at least more than returns. Short data windows with higher-frequency sampling, e.g., daily or weekly rather than monthly, appear to work best. Investors can take advantage of this predictability through risk-based investing strategies, such as managed volatility strategies and covered call writing.

However, under the surface of predictable volatility lies a plethora of risk monsters. As mentioned above, diversification almost always fails when we need it the most. So-called tail risks are much harder to model and predict than volatility itself; risk regimes can shift portfolio risk exposures drastically over time; and so on. Thankfully, our industry has advanced beyond models that rely on the normal probability distribution. Investors are now equipped with various methodologies to deal with—though not eliminate—these issues.

The issue of fat tails should not be underestimated. Volatility is too crude a risk measure if exposure to loss is what matters. Most investors and academics agree with this statement, and the events of 2020 have made it even more obvious. Several analytical tools are available to asset allocators to model fat tails, such as historical analysis, blended probability distributions, and scenario analysis.

Taleb (2007) argues that we can't predict tail events. We don't know when extreme losses will occur, but we should build resilience to them. Black swans, such as the coronavirus pandemic, are rare, but they do exist. "The Black Swan idea is not to predict—it is to describe this phenomenon, and how to build systems that can resist Black Swan events. … Black Swans being unpredictable, we need to adjust to their existence (rather than naively try to predict them)."[2] There are many examples where we must build resilience to rare but consequential events that we can't predict, in all areas of life. Pick your analogy: Skiers wear helmets; cars have air bags; houses are built to withstand hurricanes; boats are built to withstand rogue waves; planes are built to withstand lightning; etc.

However, a strict interpretation of Taleb's Black Swan theory seems impossible to implement with models and data, because, in his words, a black swan "lies outside the realm of regular expectations, because nothing in the past can convincingly point to its possibility." If nothing in the past can convincingly point to the possibility of an event, we might as well throw our hands up and not even try to forecast risk. Or, I suppose, we can imagine what could happen, even though it has never happened. Tomorrow, pigs could fly. There's something unsatisfying and defeatist about this interpretation of the theory.

Instead, asset allocators can define outliers as possible but rare events—the financial equivalents of the car crash, the hurricane, the rogue wave. We have little data for these events, but we do have evidence of their possibility. We can't necessarily forecast their exact timing, but as Peter Bernstein wrote in his book *Against the Gods: The Remarkable Story of Risk*, "It is in those outliers and imperfections that the wildness lurks."

Financial advisors, investment managers, consultants, individual investors, and everybody else involved in investment management must at some point determine their or their end investor's risk tolerance and align the portfolio's risk accordingly. If we ignore fat tails, we underestimate exposure to loss and take too much risk relative to the investor's risk tolerance.

Here are my rules of thumb for risk forecasting:

Rules of thumb for risk forecasting

- When in doubt, use short data windows, even for medium-term forecasts.
- Use higher-frequency data, including for low-frequency volatility forecasts.
- If available, use information derived from options prices, i.e., implied volatility.
- Account for the fact that volatility is most persistent over shorter horizons.
- Do not worry too much about the need to use highly sophisticated models.
- Expect some mean-reversion for long-term forecasts, i.e., over five or more years.
- Recognize that fat tails matter and should be included in your risk forecasts.
- Separate your dataset into regimes and assign probabilities to each regime.
- Build historical and forward-looking scenarios to stress-test exposure to loss.
- Model exposure to loss both at the end of and within the investment horizon.

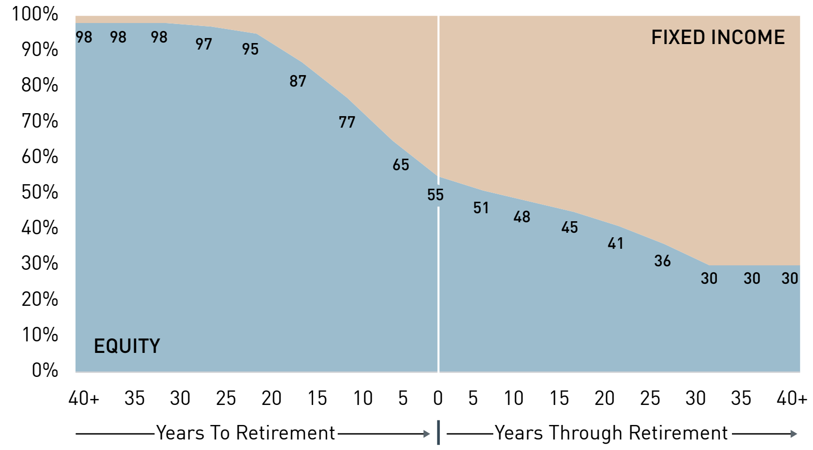
This leads us to portfolio construction. There is a debate in our industry about the relative merits of asset classes versus risk factors. Risk-factor analysis can be quite useful to forecast risk and generate scenarios, but there's a fair amount of hype around factor-premia products. It helps to clarify what we mean by "risk factors." Investors do not necessarily need to substitute asset classes for risk factors as the key building blocks for asset allocation. Rather, they can combine these approaches. Perhaps the key portfolio-construction question investors face is how much risk they are prepared to assume to reach their goals. The calibration of the stock-bond mix usually comes next. To answer these types of life-cycle investing questions, target-date strategies can provide a useful reference. With these types of funds, the stock-bond mix changes over time and is determined by the investor's retirement date and age. This glide path typically is constructed with the help of multi-period optimization models. These utility-based models seek to integrate capital-market projections with investor preferences as well as behavioral and demographic considerations. Figure 4 shows an example of a popular glide path based on age.

Given low expected returns going forward and increasing longevity risk, the answer to the question of "How much should I own in stocks?" is often "Probably more than you think." This target-date strategy suggests that someone who is 15 years from retirement, say 50 years old, should hold about 80 percent of their portfolio in stocks. At retirement, the equity weight is about 55 percent, which may seem high, but at age 65, retirees can expect to live for another 20-plus years.

On single-period portfolio optimization, no single approach works perfectly. Each model has strengths and weaknesses. Tail-risk-aware optimization models can be quite useful, but investors must use them carefully to avoid issues with small data samples. Once again, it helps to combine different methodologies. In doing so, investors must use a healthy dose of judgment. Many investors take a dogmatic view on portfolio optimization. The topic is surprisingly polarizing, especially among quants. Some believe that portfolio optimization should not be used at all. Others believe firmly in a specific model. Ultimately, investors

Figure 4

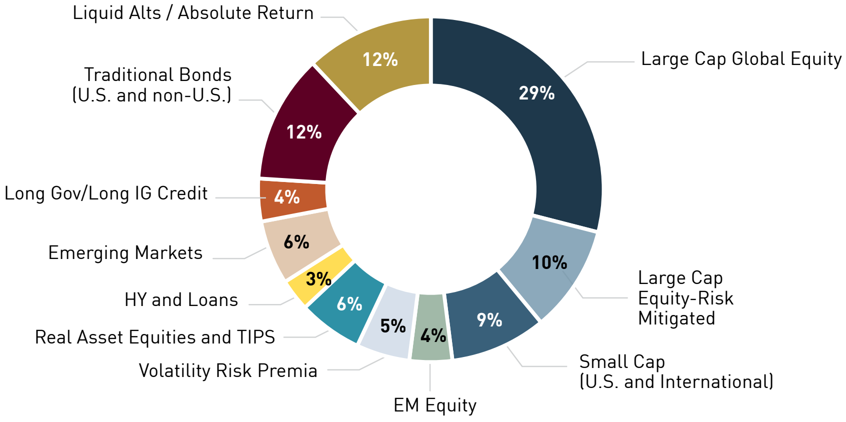
TARGET-DATE GLIDE PATH



Illustrative purposes only

Figure 5

MODERNIZED 60/40 APPROACH



Provided for informational purposes only. This material is not intended to be a recommendation or advice to undertake any investment action, because each investor's portfolio is built on many custom inputs, including individual circumstances, investment objectives, and risk tolerance.

should use various models and assumptions to better understand the trade-offs among asset classes in their portfolios. The key question is not whether a model is flawless or more theoretically elegant than an alternative model. The question is whether the model helps investors arrive at better decisions.

Lastly, specific challenges in portfolio construction merit attention, e.g., the role of alternative assets and the role of index-based, i.e., passive, building blocks. Alternative assets must be handled with care. Return and risk estimates must be adjusted to reflect the somewhat hidden reality that alternative assets are not a free lunch. To be clear, there is no reason to rule out the role of alternative assets, but asset allocators must look beyond published internal rates of return and volatilities.

As for the active versus passive debate, both approaches can coexist. The rise in index-based products provides opportunities for active managers. For example, heavy exchange-traded fund (ETF) trading volumes lead to abnormally high correlations, which provides opportunities for stock pickers. Once again, there's no need to take a dogmatic view. Both passive and active strategies can be useful, depending on investor preferences. But active investment management is not about to disappear. It remains at the heart of our economic system. Not every manager is average, and skilled active management, with a repeatable process, can deliver better outcomes than index exposures over time.

Ultimately, how should investors allocate their assets in a way that integrates the key principles of modern finance? How should they diversify their portfolios when we know that diversification often fails, and to make things worse, bonds no longer diversify stocks as much as they did in the past? (There's only so much they can rally from the lower bound. Long Japanese Government Bonds were slightly down during the coronavirus sell-off, while Long Treasuries rallied 20 percent.[3] Are Japanese Government Bonds showing us the future for Treasuries?)

The short answer is that the 60/40 portfolio is not dead but needs to be modernized. The model portfolio in figure 5 provides an example of a modernized 60/40 portfolio. Note that this portfolio is an example to provide an illustration and does not constitute advice. There is an allocation to high-return-seeking diversifiers such as small- and mid-cap stocks, high yield, and emerging market debt; 12 percent from traditional bonds is moved toward an allocation to liquid alternatives, in particular those that allow long-short investing. Five percent is allocated to a risk premium or factor strategy, i.e., the volatility premium. Importantly, there is a dedicated long bond allocation of 3–4 percent. Also, 10 percent of the equity exposure is moved to risk-managed equities, which embed tail-risk hedging strategies. These strategies seek to stabilize the risk in the portfolio dynamically to help mitigate large losses during turbulent markets. A simple example would be a strategy where 50 percent is allocated to an active core equity strategy and the other 50 percent is a dynamic sleeve that switches between stocks and bonds ETFs to manage volatility dynamically.

Meanwhile, tactical relative valuation opportunities continue to evolve in real time, and asset allocators continue to improve strategic portfolio construction.

Here are my rules of thumb for portfolio construction:

Rules of thumb for portfolio construction

- Don't use factors as substitutes for asset classes—there's no need to overhaul portfolio construction.
- Use risk-factor models to assess portfolio diversification, forecast risk, and enhance scenarios.
- Consider risk premia as possible small stand-alone investments but beware of backtest results.
- Solve this question first: What stock-bond mix matches the investor's goals and risk tolerance?
- Use portfolio optimization models, judgment, and experience to populate the stock-bond mix.
- Consider alternatives as diversifiers but beware of inflated returns and underreported risks.
- Allocate between active and passive strategies as a function of active risk tolerance and fees.

Continued on page 60 →

WHEN DIVERSIFICATION FAILS . . .

Continued from page 22

The practice and science of asset allocation will continue to merge in a never-ending quest to deliver better outcomes to investors. Going forward, the challenges with the failure of simple diversification will be more pronounced than in the past because we are near the zero-bound in interest rates, which means we should expect lower returns over the next five to 10 years. Those willing to venture into return forecasting, risk forecasting, and portfolio construction will find that process matters. For advisors, process helps build scale to multiple portfolios and multiple clients. For individuals, process builds consistency in performance and clarity of expectations. Simply put, process leads to better decisions. There are many challenges with asset allocation. When we invest, we forecast the future, and that's a difficult thing to do. But returns and risks are forecastable enough, such that quantitative models, combined with judgment, can add significant value.

Sébastien Page, CFA®, is head of the Global Multi-Asset Division at T. Rowe Price, where he oversees an investment team dedicated to actively managing a broad set of multi-asset portfolios, including the firm's target-date franchise. He is a member of the firm's Asset Allocation Committee and Management Committee. He earned an MS in finance and a bachelor's degree in business administration from Sherbrooke University in Quebec, Canada. Contact him at mediarelations@troweprice.com.

ENDNOTES

1. Forecast analysis is illustrative and based on the following inputs as of March 3, 2021: Next 12-month P/E ratio (combination of Shiller CAPE and Siegel), yield estimate, inflation assumption based on 10-year breakeven, Year-to-Worst yield for Bloomberg Barclays U.S. Aggregate Bond Index. Sources: Bloomberg Finance L.P, Bloomberg Index Services Limited.
2. See "A Conversation between Nassim Nicholas Taleb and Stephen Wolfram at the Wolfram Summer School 2021," http://nassimtaleb.org/tag/fat-tails/ and Taleb (2007).
3. ICE BofA US Treasury (10+ Year) Index, ICE BofA Japan Government (10+ Year) Index, Total Return Analysis, Barclays Indices, Bloomberg, Q1 2020.

REFERENCES

Bernstein, Peter. 1996. *Against the Gods: The Remarkable Story of Risk*. Hoboken, NJ: John Wiley & Sons, Inc.

Leibowitz, Martin L., and Anthony Bova. 2009. Diversification Performance and Stress-Betas. *Journal of Portfolio Management* 35, no. 3: 41–47.

Page, Sébastien. 2020. *Beyond Diversification: What Every Investor Needs to Know About Asset Allocation*. New York: McGraw-Hill Education.

Page, Sébastien, and Robert A. Panariello. 2018. When Diversification Fails. *Financial Analysts Journal* 74, no. 3: 19–32.

Taleb, Nassim Nicholas. 2007. *The Black Swan: The Impact of the Highly Improbable* (2nd ed.). London: Penguin.

Data Sources – Figure 1

The conditional correlations shown were based on the following asset classes, indexes, and data series start dates. U.S. Stocks/Large Stocks: MSCI USA Index, January 1970; Developed Markets (EAFE) Stocks: MSCI EAFE Index (Local), January 1970; Emerging Markets (EM) Stocks: MSCI Emerging Markets Index (Local), January 1988; Growth Stocks1: Russell 1000 Growth Index, February 1978; Small Stocks: Russell 2000 Index, February 1978; Corporate Bonds: Bloomberg Barclays U.S. Corporate Index, August 1988; Mortgage Backed Securities: Barclays U.S. MBS Index, August 1988; High Yield (HY) Bonds: Bloomberg

Barclays U.S. High Yield Index, August 1988; Emerging Market (EM) Bonds: Bloomberg Barclays Emerging Markets Bond Index, August 1988; Real Estate: NAREIT All Equity Index, January 1972; Hedge Funds: HFRI Global Hedge Funds Index, January 1988.

The views expressed are those of the author, are subject to change without notice, and may differ from those of other T. Rowe Price associates. Information and opinions are derived from proprietary and nonproprietary sources deemed to be reliable; the accuracy of those sources is not guaranteed.

This material does not constitute a distribution, offer, invitation, recommendation, or solicitation to sell or buy any securities; it does not constitute investment advice and should not be relied upon as such. Investors should seek independent legal and financial advice, including advice as to tax consequences, before making any investment decision.

Past performance is not a reliable indicator of future performance.

All investments involve risk. The charts and tables are shown for illustrative purposes only. There is no guarantee that any forecasts made will come to pass.

202106-1675044

CONTINUING EDUCATION
To take the CE quiz online, go to
www.investmentsandwealth.org/IWMquiz

INVESTMENTS & WEALTH INSTITUTE®

5619 DTC Parkway, Suite 500
Greenwood Village, CO 80111
Phone: +1 303-770-3377
Fax: +1 303-770-1812
www.investmentsandwealth.org

© 2021 Investments & Wealth Institute®. Reprinted with permission. All rights reserved.

INVESTMENTS & WEALTH INSTITUTE® is a registered mark of Investment Management Consultants Association Inc. doing business as Investments & Wealth Institute. CIMA®, CERTIFIED INVESTMENT MANAGEMENT ANALYST®, CIMC®, CPWA®, CERTIFIED PRIVATE WEALTH ADVISOR®, RMA®, and RETIREMENT MANAGEMENT ADVISOR® are registered certification marks of Investment Management Consultants Association Inc. doing business as Investments & Wealth Institute.