



DC Solutions Series

Risk Parity in Target-Date Funds

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Robert Capone

Managing Director, Head of Defined Contribution and Sub Advisory, AQR Capital Management

Adrienne Ross

Associate, Portfolio Solutions Group, AQR Capital Management

What Is Risk Parity?

Risk Parity uses the power of diversification to build a higher expected return portfolio without the risk concentration found in traditional allocation strategies.

Risk Parity's Role Within a Target-Date Fund (TDF):

- Helps diversify largest source of risk within TDFs — equity risk
- Actively manages risk to reduce drawdowns; this is particularly important in later stages of retirement
- Reduces home bias by investing globally across stocks, bonds and commodities

AQR Capital Management, LLC

Two Greenwich Plaza
Greenwich, CT 06830

p: +1.203.742.3600

f: +1.203.742.3100

w: aqr.com

The Dilemma in Defined Contribution Investing

Over a 40 year work life cycle, plan participants investing within Defined Contribution (DC) plans are trying to maximize their respective retirement outcomes. These outcomes can be summarized in two major areas: 1. wealth accumulation and, 2. wealth preservation.

To help solve for these outcomes, plan sponsors have flocked to the target-date fund (TDF) as a solution for participants to save for retirement. Regulatory direction has anointed the TDF as a Qualified Default Investment Alternative (QDIA), which has promoted substantial and ongoing inflows to these types of savings vehicles across the DC plan universe.

Though TDFs have become the most popular DC investing vehicle, several shortcomings should be addressed to more reliably maximize retirement outcomes.

The Problem With Target-Date Funds: Not Sufficiently Diversified

Traditional TDFs tailor their portfolio management to the age of the plan participant. This approach enables participants to make a simple ready-mixed asset allocation choice — selecting the vintage (generally at five year increments) that most closely approximates their retirement year.

As participants age, their risk tolerance decreases. To reflect this change in risk tolerance or preference, most traditional TDFs glide from a concentrated equity portfolio — say 90/10 stocks/bonds — to a more capital “balanced” portfolio, such as 60/40 or even a 50/50 allocation. Yet, even these near-retirement portfolios are not truly balanced: because equities can have approximately three to four times the risk¹ of bonds, these “moderate” allocations lead to portfolios that are roughly 90% dominated by equity risk.

Exhibit 1 looks at an average TDF glide path, both in terms of capital and risk. It shows that even though the portfolio de-risks over time (by reducing its equity allocation) it still suffers from concentrated equity risk at retirement. Concentrated risk can leave a portfolio susceptible to market tail events — events that can have a particularly large impact on participants near retirement (as they have less tolerance and less flexibility in their work life cycle to endure such an event).

¹ Risk here is taken to mean volatility. Volatility is not the same as risk, but it's an important input in determining the risk of an asset. Throughout this paper, “risk” is measured as the volatility (standard deviation) of returns. However, the concepts presented extend to other measures of risk such as marginal risk contribution, value-at-risk (VaR), stress test based loss estimates, and other measures of risk. These risk exposures are based on AQR volatility and correlation estimates and are for illustrative purposes only.



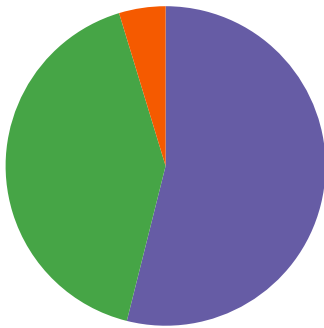
Exhibit 1 | Traditional Target-Date Funds Are Heavily Concentrated in Equity Risk

Capital Allocation of a Traditional TDF Glide Path (Average Across Three Largest TDF Providers)

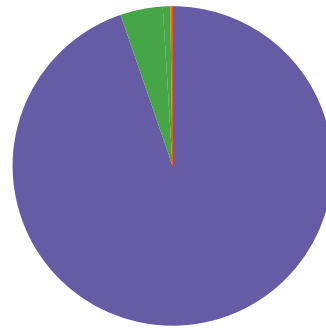


Even at Retirement, TDFs May Seem Diversified ...

... But in Practice, Their Risk Is Still Driven by Equities



How Dollars Are Allocated



How Risk Is Allocated

■ Equities ■ Fixed Income ■ Other (Cash or Commodities)

Source: AQR. For illustrative purposes only and not representative of any AQR product or investment. The traditional TDF glide path uses the average recommended asset allocation from the three largest providers: Fidelity, Vanguard and T. Rowe Price as of June 2014.



The overreliance on equities resulting from a lack of meaningful risk (versus capital) diversification is just one example of the inadequate diversification found within TDFs. **Exhibit 2** provides a brief list of, and ways to address, these shortcomings.

Exhibit 2 | Shortcomings of Traditional Target-Date Funds

Shortcomings of TDFs	Proposed Improvement
Equity risk concentration	Risk balanced asset allocation
Home biased investing	Allocate globally
Poorly diversified asset allocation	Provide diversifying sources of return from exposure to new asset classes
Sensitivity to volatile periods	Dynamically manage risk

Source: AQR. This list may not be all encompassing.

A Solution: Risk Parity

Risk Parity aims to better diversify portfolios by allocating risk such that everything matters, but nothing matters too much. Risk Parity portfolios invest globally across a broad range of assets, including stocks, bonds and commodities. The approach allocates proportionately smaller amounts to riskier assets and larger amounts to assets that are less risky, while still taking about the same average total amount of risk as a traditional portfolio. By balancing risk across assets, this approach may be able to provide an advantage over traditional portfolios; it may provide better risk-adjusted returns over the long-run.² This is an especially important outcome for DC plan participants, who have a long-term investment horizon.

What Is the Concept Behind Risk Parity?

Risk Parity relies on *risk-based* diversification, seeking to generate both higher and more consistent returns across a wide range of scenarios. The typical Risk Parity portfolio begins with a lower exposure to equities relative to traditional portfolios, and invests significantly more in other asset classes. As a result, the risk of the portfolio is not concentrated in equities, but spread more evenly across asset classes, including equities.

The key to Risk Parity is to diversify across asset classes that behave differently across economic environments. In general, equities tend to do well in high growth and low inflation environments, bonds tend to do well in deflationary or recessionary environments, and commodities tend to perform best during inflationary environments. Having balanced exposure to these three main asset classes may produce more consistent long-term results.

To assess how investments respond to macroeconomic risks, we can look at historical performance across four simplified environments: when the economy is overheating (when growth and inflation are up), a “Goldilocks” environment (when growth is up and inflation is down), stagflationary periods

² We believe that the advantage Risk Parity has over traditional equity dominated portfolios is a modest one, but one that can accumulate to a big one over enough time. Such an advantage, in our belief, will win long-term, but may not win all the time.



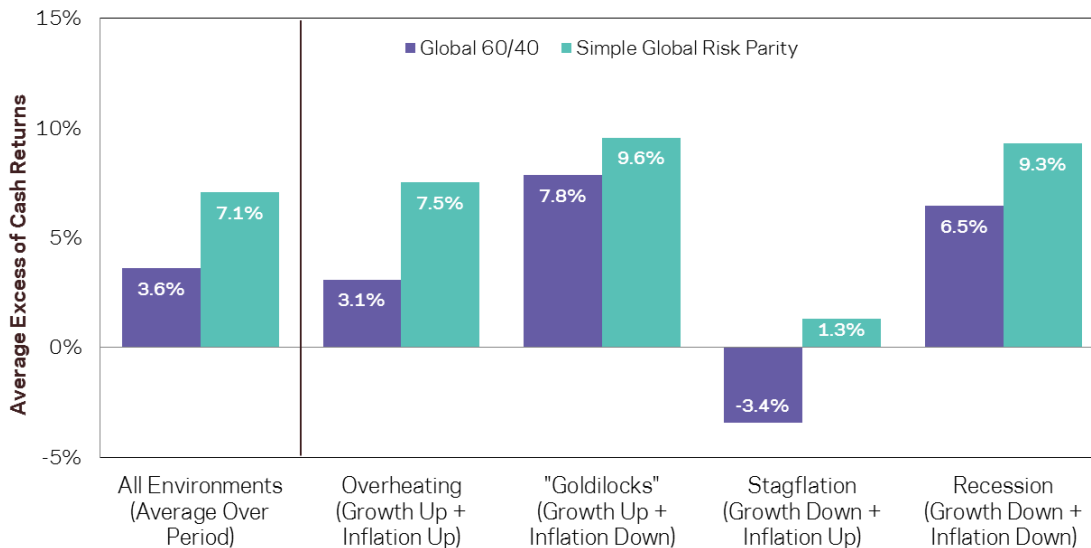
(when growth is down and inflation is up), and recessions (when growth and inflation are down).³

Exhibit 3 shows the average excess of cash returns in these environments for two portfolios: a representative TDF portfolio close to retirement, with 60% stocks and 40% bonds⁴, and a Simple Risk Parity portfolio of stocks, bonds and commodities.

The chart shows that the 60/40 portfolio is sensitive to economic regimes. Generally there is large variation in performance across environments, and the portfolio suffers on average during stagflationary environments. But investors who better balance risks by increasing allocations to bonds and commodities may achieve more balanced macroeconomic exposures, as seen by the stability across bars. The Risk Parity portfolio was especially helpful in both the overheating and stagflationary environments — both of which are characterized by high and rising inflation.

These results are particularly important for DC investors, whose goals are to maximize wealth and preserve wealth accumulation. Exhibit 3 shows that on average, a diversified Risk Parity portfolio delivered more consistent returns across economic environments.

Exhibit 3 | Risk Parity Shows More Consistency Across Macroeconomic Environments, 1972-2013



Source: AQR. Global 60/40 is representative of a traditional TDF close to retirement. Global Equities is the MSCI World net; Global Bonds is a GDP-weighted composite of Australian, German, Canadian, Japanese, U.K. and U.S. 10-year government bonds; commodities is an equal-dollar-weighted index of 24 commodities. Global 60/40 takes 60% Global Equities and 40% Global Bonds. The Simple Global Risk Parity portfolio targets an equal amount of risk in equities, bonds and commodities. It is rebalanced every month to target a constant portfolio volatility of 10% annualized. To target portfolio volatility, we use a simple forecast for asset volatility: the most recent realized 12-month volatility for each asset class. The methods of implementation vary significantly across different risk parity managers. Returns are calculated gross of fees; if fees were included the results would be lower. Data presented is based on hypothetical portfolios and is not representative of any AQR product or investment. We do not simulate a glide path.

³ 'Inflation Up' is characterized by periods where the inflation level is high (measured relative to CPI YoY median estimate over 1972-2013) and inflation surprised to the upside (CPI YoY was higher than consensus economist forecasts a year earlier). 'Growth Up' is characterized by periods where growth is high (measured relative to CFNAI median estimate over 1972-2013), and growth surprised to the upside (Industrial Production was higher than consensus economist forecasts a year earlier).

⁴ Note that we look at a global portfolio. The average TDF may have more home bias, but the broader results will not change.



Risk Parity as a Component Within a TDF

So far we have focused on Risk Parity as an entire portfolio, but the case for Risk Parity still applies when used as a component within a TDF. We have seen that Risk Parity on its own is a highly diversified portfolio, but it is also important to DC plan participants that it provides effective and meaningful diversification benefits within a traditional TDF. As a starting point, we believe that plan sponsors should incorporate Risk Parity within TDFs. The inclusion of Risk Parity can help enhance returns, create more stable returns, and reduce the frequency and magnitude of drawdowns throughout the investing life cycle of plan participants. These benefits are summarized in **Exhibit 4**.

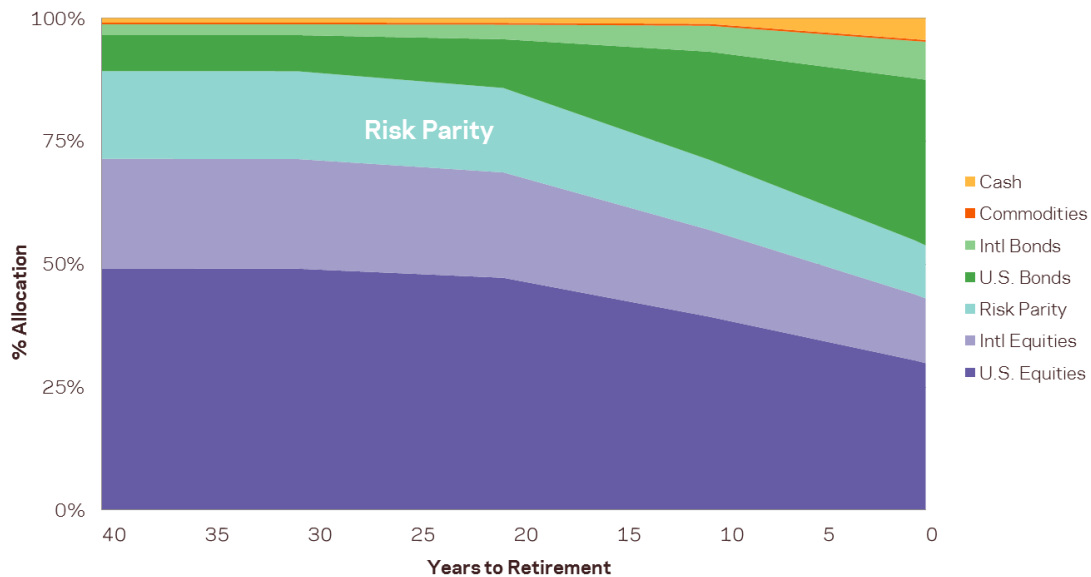
Exhibit 4 | Key Benefits of Risk Parity in a TDF

Role Within a Target-Date Portfolio	Is Risk Parity a Solution?
Return Enhancer	Yes
Portfolio Diversifier	Yes
More Risk Control	Yes
Limit Drawdowns	Yes

Source: AQR.

These benefits are most pronounced when the allocation is taken from equities. To assess this we can construct a hypothetical glide path for a portfolio that takes the traditional TDF asset weights (as shown in Exhibit 1) but re-allocates 10%, 20% or 30% of equities to Simple Risk Parity. The 20% reallocation is shown in **Exhibit 5**. In order to maintain the risk profile of the traditional TDF, we allocate to a Risk Parity strategy that targets roughly the same volatility of equities (15% volatility). These implementation choices result in the most meaningful outcomes. But this may not be a one-size fits all solution. Plan sponsors may prefer to allocate pro-rata (rather than from equities) or to a lower volatility Risk Parity portfolio (rather than one with the same volatility as equities). Regardless of these implementation choices, the broader benefits of Risk Parity in a TDF will still hold.

Exhibit 5 | Glide Path With 20% Allocation to Risk Parity



Source: AQR. For illustrative purposes only and not representative of any AQR product or investment.

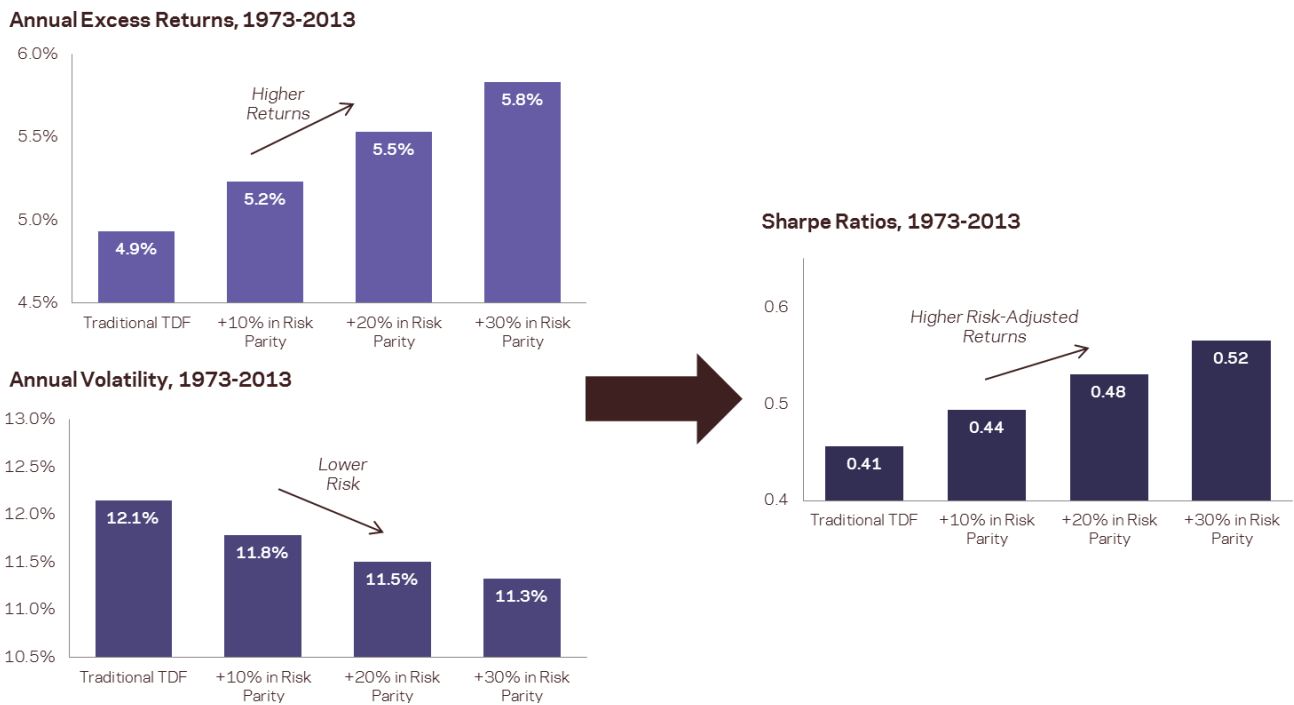


Benefit #1: Risk Parity as a Portfolio Diversifier

The inclusion of a diversifying source of return can improve the risk/return characteristics of an overall TDF portfolio, by enhancing returns, reducing risk, or a combination of both. More diversified portfolios tend to have higher Sharpe ratios.⁵ Exhibit 6 shows how the inclusion of Risk Parity can benefit a traditional TDF in terms of risk and return. It focuses on the cohort that retired in 2013, and assumes that participants worked over 40 years and stayed invested throughout the period. It looks at 10%, 20% or 30% allocations away from equities toward Risk Parity.

The results show that the inclusion of Risk Parity improved the Sharpe ratio (or risk-adjusted return) of a traditional TDF. This was a result of *both* higher returns and lower volatility.⁶ Greater allocations produce even more pronounced results, but even a 10% allocation can be beneficial.

Exhibit 6 | TDFs That Incorporate Risk Parity May Deliver Higher Risk-Adjusted Returns



Source: AQR. Returns are nominal, gross of fees and transaction costs. The analysis assumes that the participant worked for 40 years and stayed invested throughout the period (1973-2013) prior to their retirement year. The traditional TDF glide path uses the average recommended asset allocated from the three largest providers as of June 2014. The glide path with Risk Parity re-allocates 10/20/30% of Global and U.S. Equities toward Risk Parity. U.S. Equities is the S&P500; Global Equities is the MSCI World net; U.S. Bonds is constant-maturity 10-year Treasuries; Global Bonds is a GDP-weighted composite of Australian, German, Canadian, Japanese, U.K. and U.S. 10-year government bonds; commodities is an equal-dollar-weighted index of 24 commodities. The Global Risk Parity portfolio targets an equal amount of risk in equities, bonds and commodities. It is rebalanced every month to target a constant portfolio volatility of 15% annualized (to roughly match volatility of equities). To target portfolio volatility, we use a simple forecast for asset volatility: the most recent realized 12-month volatility for each asset class. The methods of implementation vary significantly across different risk parity managers. Returns are calculated gross of fees; if fees were included the results would be lower. Data presented is based on hypothetical portfolios and are not representative of any AQR product or investment.

⁵ Mathematically, the Sharpe ratio is the annualized return in excess of cash (total return – risk-free return) divided by the annualized standard deviation (or volatility) of returns.

⁶ If the plan sponsor chose to re-allocate away from equities toward a lower volatility Risk Parity strategy (lower than the equity-representative portfolio at 15% volatility) it would experience a more pronounced reduction in risk, but not necessarily an enhancement of total returns. It would still improve risk-adjusted returns.



Benefit #2: Risk Parity May Help Limit Drawdowns and Maximize Wealth

In addition to Risk Parity's better risk diversification, Risk Parity's better targeted level of portfolio risk can help mitigate tail events. This can be especially valuable for the last decade before retirement, when investors have accumulated larger savings. Large losses can have a meaningful impact on accumulated savings; it takes an even larger gain (or an extended period of gains) to recover after a loss.⁷ Investors near retirement are particularly sensitive to tail risk as they may be less able to increase future income if capital markets disappoint (unlike younger investors who may have more flexibility).

To see how tail events in the last 10 years before retirement may affect accumulated savings we can look at **Exhibit 7**. Part A shows performance during select stress periods, while Part B shows ending retirement values for the same four portfolios. The results show that a TDF with an allocation to Risk Parity would have helped mitigate losses during the tech bust (04/00-02/03) and the credit crunch (07/07-03/09). It also would have helped reduce maximum drawdown over the entire 40 year horizon.

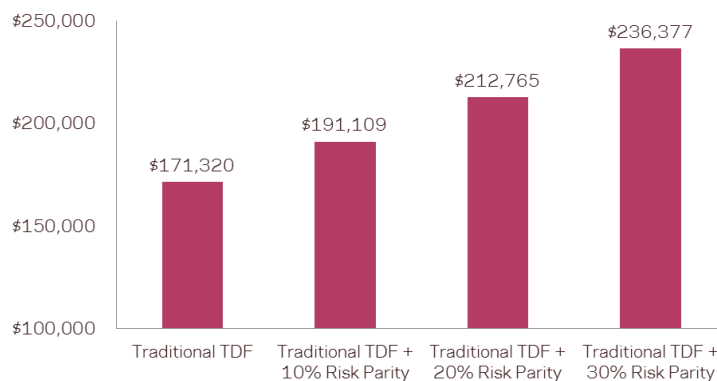
Between the tech bust and financial crisis, plan participants who retired after 2008 may have had insufficient retirement income. But the inclusion of Risk Parity would have led to higher ending real retirement wealth, as shown in Part B.

Exhibit 7 | Risk Parity May Help Limit Tail Risk and Maximize Wealth

Part A: Performance During Stress Periods

	Traditional TDF	Traditional TDF + 10% Risk Parity	Traditional TDF + 20% Risk Parity	Traditional TDF + 30% Risk Parity
Tech Bust (4/00 - 2/03)	-25.7%	-21.0%	-16.1%	-10.9%
Credit Crunch (7/07 - 3/09)	-24.3%	-21.4%	-18.3%	-15.2%
Max Drawdown (1973-2013)	-32.9%	-30.5%	-28.0%	-26.1%
Downside Market Capture Ratio (1973-2013)	64.6%	62.1%	59.5%	57.0%

Part B: Real Ending Wealth at Retirement, 1973-2013



Source: AQR. For Part A returns are nominal, gross of fees and transaction costs. Downside market capture is relative to MSCI. For Part B returns are real, gross of fees and transaction costs; Part B assumes participants invest \$1000 every calendar year (as of December 31). Returns are calculated gross of fees; if fees were included the results would be lower. Data presented is based on hypothetical portfolios and are not representative of any AQR product or investment.

⁷ This is due to the compounding of returns.



Conclusion

We believe that implementing Risk Parity as a sleeve within a TDF can help address participant retirement savings goals — it may enhance returns, mitigate risk and reduce portfolio drawdowns. We recommend allocating to Risk Parity away from equities to maximize equity risk reduction. Including Risk Parity as a component within a TDF is an effective way for plan participants to gain access to the benefits of the strategy. This method can lessen the participant educational challenges associated with offering it as a standalone investment option.

We have shown more demonstrable results as allocations to Risk Parity increased from 10% to 30%. Ultimately, an allocation to Risk Parity can provide valuable diversification benefits to traditional TDFs and to DC plan participants investing for retirement.

Why AQR for Defined Contribution?

AQR is a custom retirement investment solutions provider. We focus on both nontraditional investment solutions and innovative long-only, style-based investment capabilities to address retirement savings risks.

Our approach to investing — meaningfully diversified, long-term and disciplined — seeks to help investors retire comfortably and soundly.



Biographies

Robert G. Capone, Managing Director

Rob is the Head of Defined Contribution (DC) and Sub Advisory for AQR. In that role, he leads AQR's efforts to bring the firm's investment solutions to those specific markets. Prior to AQR, he was an executive vice president Head of Retirement and Sub Advisory at BNY Mellon Investment Management, and a managing director and director of participant services at Putnam Investments. He began his DC career at Fidelity Investments. He is an industry member of both the Retirement Services Leadership Council and the Defined Contribution Institutional Investment Association. Rob earned an A.B. in economics from Dartmouth College and an M.B.A. from The Tuck School of Business at Dartmouth College.

Adrienne Ross, Associate

Adrienne is a member of AQR's Portfolio Solutions Group, where she writes white papers and conducts investment research. She is also involved in the design of multi-asset portfolios and engages clients on portfolio construction, risk allocation and capturing alternative sources of returns. She has published research on how different investments respond to economic environments in the *Journal of Portfolio Management*, regional economic factors in the *Journal of Economic Geography* and on the Web site of the Federal Reserve Bank of New York. Prior to AQR, she was a senior account associate at PIMCO. She began her career as a researcher at a macroeconomic think tank in Canada. Adrienne earned a B.A. in economics and mathematics from the University of Toronto and an M.A. in quantitative finance from Columbia University.



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