The Glidepath Illusion: *An International Perspective*

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Target-date or lifecycle funds have been growing at a very rapid rate over the past few years and currently are the default option in many employer-sponsored and individual retirement plans.[1] These funds become increasingly conservative as the retirement date approaches, largely by reallocating capital from stocks to bonds and cash, and are based on the seemingly plausible idea that investors are able to take larger risks when they are young than when they are approaching retirement. Is it possible that, despite their popularity and many valuable characteristics, these funds could be detrimental to investors?

Arnott [2012] suggests that this is indeed the case. In a recent and provocative article, he argues that investors would be better off following a strategy opposite to that implemented by target-date funds. In fact, he argues that, if investors focus on the capital accumulated at retirement, instead of making their portfolios more conservative, they should make their portfolios more aggressive as retirement approaches.

This counterintuitive recommendation follows from a rather obvious but often overlooked fact first highlighted by Shiller [2005]: Target-date funds expose investors to stocks more in the early years, when the accumulated capital is not large, and less in later years, when the accumulated capital is much larger. Put differently, these funds are aggressive when the portfolio is small and conservative when the portfolio is large, which is likely to be suboptimal in terms of capital accumulation.

However, as defenders of target-date funds correctly point out, the goal of these funds is not to maximize the accumulated savings at retirement, but rather to balance risk and return.[2] In other words, these funds are designed to be aggressive when investors are young and more able to bear losses, and to progressively reduce the likelihood of negative surprises as investors approach retirement and their desire or ability to bear risk wanes. This is in fact consistent with evidence showing that, when approaching retirement, most target-date fund users prefer downside protection, rather than upside potential.[3]

As is the case with many issues in finance, this controversy perhaps ultimately comes down to how risk is defined. A conservative strategy may deliver a smooth ride and few negative surprises, but it is likely to underperform an aggressive strategy in terms of the capital accumulated at retirement. So which strategy is riskier: the one that delivers the bumpier ride or the one that is likely to underperform in the long term? Needless to say, a consensus on this issue is hard, if not impossible to reach.

And yet the comprehensive international sample considered in this article provides some interesting insights. First, the mean and median terminal wealth are lower with strategies that become more conservative as retirement approaches (lifecycle strategies) than with those that become more aggressive as retirement approaches (contrarian strategies). Second, contrarian strategies outperform lifecycle strategies in terms of all the upside potential variables considered here.

Third, contrarian strategies keep investors more uncertain about their terminal wealth than lifecycle strategies. But, fourth, the former's downside potential is typically more limited; that is, contrarian strategies tend to deliver a higher terminal wealth in bad scenarios than lifecycle strategies do.

These last two points combined imply that, fifth, the higher uncertainty of contrarian strategies is basically uncertainty about how much better, not how much worse, investors are expected to fare with them than with lifecycle strategies. Finally, the results just summarized generally apply to the comparison between lifecycle strategies and the other (equity-driven and balanced) strategies considered in this article.

The rest of the article is organized as follows. The next section discusses in more detail the issue at stake and the most relevant contributions on this topic. The section that follows it discusses the evidence from a comprehensive sample covering 19 countries, two regions, and the 11 full decades between 1900 and 2009. Finally, the last section provides an assessment. An Appendix concludes the article.

THE ISSUE

Lifecycle Strategies and Glidepaths

Financial advisors typically recommend that investors adjust their asset allocation over time so that their portfolios become increasingly conservative as they approach retirement. This is achieved by periodically reducing the allocation to relatively more-volatile assets, such as stocks, and increasing the allocation to relatively less-volatile assets, such as bonds and cash. This broad strategy is typically referred to as a lifecycle strategy and is at the center of the issues discussed in this article.

A glidepath is the relationship between a fund's asset allocation and the investor's age, or number of years to retirement.[4] There are two types of glidepaths, glide to and glide through; the former features an asset allocation that evolves until the retirement date, and the latter, an asset allocation that keeps evolving after the retirement date. "Through" glidepaths predominate in terms of both number and assets under management.

Although glidepaths vary considerably across providers, all of them share two characteristics. First, the asset allocation is adjusted exclusively as a function of the number of years to retirement, thus ignoring many other relevant variables, such as investors' preferences, risk tolerance, and wealth, to name but a few; and second, they all feature decreasing equity allocations and increasing bond allocations, thus becoming more conservative as retirement approaches. It is this second feature of glidepaths that Shiller [2005] and Arnott [2012] question and is also at the center of the issues discussed here.

Risk and the Holding Period

The relationship between risk and the holding period is a contentious issue with a long history in finance, often referred to as the time-diversification controversy. Estrada [2013a] discusses this topic at length and highlights that the disagreements are largely due to two reasons. First, investors assess risk in different ways and hence view its evolution over time in varied ways; and second, time diversification is a broad term often used to refer to different (though related) issues.

Regarding this latter point, three issues are often bundled within the time-diversification umbrella. The first is whether the risk of an asset, particularly stocks, decreases with the holding period. The second is whether the relative risk of two assets changes with the holding period. The third is whether, as the holding period shortens, investors should gradually decrease the proportion of more-volatile assets and increase that of less-volatile assets.[5]

Samuelson [1963, 1969] formally argued that an investor's asset allocation should be independent from the length of the holding period. In other words, the proportion of stocks, bonds, and other assets in an investor's portfolio should be the same when saving begins and when the investor is about to retire. This peculiar

argument, which holds under rather strong assumptions, spanned an extensive literature both supporting and disputing the wisdom of time diversification. See Estrada [2013a] for an overview of this discussion.

Although the controversy on this topic continues, Samuelson [1994] eventually accepted that there are valid reasons for decreasing exposure to risky assets as investors approach retirement and their holding period shortens.[6] In fact, this recommendation eventually became and currently remains the conventional wisdom and is reflected both in the standard advice given by financial advisors, and in the huge growth of target-date funds.

The Role of Periodic Contributions

Most of the time diversification literature tends to ignore an issue that is critical to the discussion here: namely, that investors make periodic contributions to their retirement funds during their working years. Hence, the capital accumulated at retirement is a function of both the asset allocation and the size and timing of the contributions.

Shiller [2005] was the first to emphasize that investors following a lifecycle strategy have a large exposure to stocks when (they are young and) their savings are low, and a small exposure to stocks when (they are older and) their savings are higher. He evaluated the wisdom of this approach through simulations, found that lifecycle strategies are too conservative, usually underperforming portfolios fully invested in stocks, and concluded that these strategies may not be optimal for investors saving for retirement.[7]

Basu and Drew [2009] consider several lifecycle strategies and their mirrors (strategies that remain invested in stocks, bonds, and cash for the same amount of time as lifecycle strategies but evolve in the opposite direction, from less aggressive to more aggressive) and find that investors should become more, rather than less aggressive over time. In other words, their results support those of Shiller [2005] and suggest that investors should follow glidepaths opposite to those featured by target-date funds. Their results also highlight that asset allocation is more important when investors are older and have larger portfolios than when they are younger and have smaller portfolios.

Ayres and Nalebuff [2010] emphasize the role of the present value of lifetime savings, defined as the value of current savings plus the present value of expected savings. They argue that savers should have a constant asset allocation (which they call the "Samuelson share") relative to lifetime savings, which typically implies a leveraged position in stocks when investors are young and their current savings are low. Importantly, the glidepath they recommend is similar to standard glidepaths, in the sense that the asset allocation becomes more conservative over time.

Notice that the extent to which the present value of expected future savings can be considered a bond really depends on the saver's type of job. A tenured professor, whose salary increases at a rather predictable rate over time, can plausibly consider the present value of her income as a bond; but it would hardly be plausible for an investment banker to do the same. Ultimately, the key variable is how correlated the expected salaries (hence expected savings) are to the stock market. The more correlated expected salaries and savings are to the stock market, the less plausible it becomes to consider the present value of expected savings as a bond.

Basu et al. [2011] question the rationale of asset allocation based only on the number of years to retirement. They argue that a dynamic switching strategy that is not unidirectional (i.e., that it is free to switch from stocks to bonds or from bonds to stocks) produces superior results. More precisely, they show that a strategy that considers both the accumulated capital and the investor's target almost stochastically dominates both lifecycle and balanced strategies.

Finally, Arnott [2012] compares a lifecycle strategy that begins with an 80–20 (and ends with a 20–80) stock–bond allocation to both a mirror strategy that begins with a 20–80 (and ends with an 80–20) stock–bond allocation, and a balanced strategy that keeps a constant 50–50 stock–bond allocation. He finds that the lifecycle strategy is inferior to the two alternatives he considers in terms of capital accumulation and thus questions the wisdom of lifecycle investing.[8] Arnott et al. [2013] elaborate on the shortcomings of lifecycle strategies and discuss potential improvements.

EVIDENCE

The literature that evaluates the plausibility of lifecycle strategies, taking into account the critical role that periodic contributions play on wealth accumulation,

besides being scarce, is both recent and largely limited to U.S. data. This is the case with the already-mentioned work of Shiller [2005], Basu and Drew [2009], Ayres and Nalebuff [2010], Basu et al. [2011], and Arnott [2012].[9] Hence, the ultimate purpose of this article is to provide a broader perspective on this issue by considering a comprehensive sample of 19 countries and two regions over 110 years.

The sample considered here is the Dimson–Marsh–Staunton [DMS] dataset, described in detail in Dimson et al. [2002]. The sample contains annual returns for stocks and government bonds over the period from 1900 to 2009. Returns for individual countries are real (adjusted by local inflation) and in local currency. Returns for the two regions considered, Europe and the world, are real (adjusted by U.S. inflation) and in dollars. In all cases, returns account for capital gains and losses and cash flows (dividends or coupons). Exhibit A1 in the Appendix summarizes some characteristics of all the series of stock and bond returns in the sample.

The investor considered here has a working life of 40 years and makes 40 annual contributions to his retirement fund. Each year he contributes an inflation-adjusted lump sum of $1,000 (a figure easily scalable, also considered by Arnott, [2012]) and rebalances his portfolio at the same time, for a cumulative contribution of $40,000 in real terms.[10] For each country and region, 71 overlapping 40-year working lifetimes are considered, the first over 1900–1939 and the last over 1970–2009. The focus of the analysis is on the series that collects the terminal wealth (the capital accumulated at retirement) across the 71 working lifetimes for each country, region, and strategy considered.

Symmetric Strategies

As already discussed, the glidepath of lifecycle strategies features allocations that become more conservative over time, with a decreasing proportion of stocks and an increasing proportion of bonds. Five such strategies are considered here. The first starts fully invested in stocks and ends up fully invested in bonds; that is, it starts with a 100–0, and ends with a 0–100 stock–bond allocation. The other lifecycle strategies considered are similar. They begin with 90–10, 80–20, 70–30, and 60–40, and respectively end with 10–90, 20–80, 30–70, and 40–60 stock–bond allocations. In all cases, the asset allocation between the beginning and the end of each 40-year working lifetime changes annually and linearly over time.

As in Basu and Drew [2009] and Arnott [2012], we evaluate lifecycle strategies against their mirrors, that is, contrarian strategies that, relative to lifecycle strategies, start and end with opposite allocations to stocks and bonds. To illustrate, we evaluate the lifecycle strategy that starts fully invested in stocks and ends fully invested in bonds against a mirror strategy that starts fully invested in bonds and ends fully invested in stocks. We evaluate the lifecycle strategy that starts with a 90–10 (and ends with a 10–90) stock–bond allocation against a mirror strategy that starts with a 10–90 (and ends with a 90–10) stock–bond allocation, and so forth.

Lifecycle and contrarian strategies are thought of as symmetric here for two reasons. First, because their asset allocations evolve in opposite directions, mirroring each other. And second, because they spend the same amount of time invested in stocks and bonds, only differing on when they do so.

Importantly, note that all contrarian strategies have a common characteristic: namely, that they are less aggressive earlier, when investors are younger and savings are lower, and more aggressive later, when investors are older and savings are higher; hence, they feature glidepaths opposite to those featured by lifecycle strategies. This makes it possible to compare the performance of standard glidepaths against that of inverse glidepaths, which in turn enables an evaluation of Shiller's [2005] critique of lifecycle strategies, that is, that it may be suboptimal to be aggressive with a small capital and conservative with much more capital.

Exhibit 1 summarizes the results of the analysis for the five lifecycle strategies considered and their respective mirrors for the U.S (Panel A) and the two regions in the sample, Europe (Panel B) and the world (Panel C). The exhibit summarizes the behavior of the series that collect, for each strategy, the terminal wealth across the 71 overlapping 40-year working lifetimes. The figures reported are averages across these 71 lifetimes and are expressed in thousands of dollars.

Consider the U.S. results first. For each pair of a lifecycle strategy and its mirror, it is always the case that

the latter accumulates a higher mean terminal wealth. In the case of the 80–20 strategy (considered by Arnott [2012]) and its mirror, the mean terminal wealth of the latter is more than 24% higher ($137.1 versus $110.4). In the case of the more extreme 100–0 strategy and its mirror, the difference in favor of the latter is almost 44% ($147.2 versus $102.5). Needless to say, these differences are substantial and relevant enough for investors to evaluate carefully, particularly given that the analysis is based on real returns and that these are differences in purchasing power.

Importantly, note that in all (lifecycle and contrarian) strategies, the mean terminal wealth is higher than the median terminal wealth, in some cases substantially so. This indicates a positive skewness in the distribution of terminal wealth, which in turn suggests two things. First, it suggests that these distributions have a higher upside potential than downside potential. Second, it implies that the probability of obtaining at least the mean terminal wealth is lower than 50%.[11] In other words, only the lucky investors obtain the mean terminal wealth.

A comparison of the median terminal wealth delivered by lifecycle strategies and their mirrors points in the same direction but favors contrarian strategies to an even larger degree. In the case of the 80–20 strategy

EXHIBIT 1

Terminal Wealth—Symmetric Strategies

This exhibit shows summary statistics for ten strategies evaluated over 71 overlapping 40-year periods, beginning with 1900–1939 and ending with 1970–2009. The strategies consider annual contributions of $1,000 in real terms; start invested in stocks in the proportion indicated by the left end of the ranges shown in the first row; finish invested in stocks in the proportion indicated by the right end of those ranges; and linearly shift between stocks and bonds, rebalancing at the end of each year, from the left to the right end of the ranges. For each of the ten strategies, the statistics describe the series that collects the terminal wealth across the 71 working lifetimes and include the mean, median, lowest (Min) and highest (Max) values, standard deviation (SD), average of the lowest decile (AvgD1) and quartile (AvgQ1), and average of the highest decile (AvgD10) and quartile (AvgQ4). The data are described in Exhibit A1 in the Appendix. All figures in thousands of dollars.

	100–0	0–100	90–10	10–90	80–20	20–80	70–30	30–70	60–40	40–60
Panel A: USA										
Mean	102.5	147.2	106.4	142.1	110.4	137.1	114.5	132.3	118.8	127.7
Median	84.6	130.5	91.8	128.9	101.5	132.1	111.6	129.6	113.8	123.6
Max	222.3	273.4	213.5	246.9	204.0	231.4	193.9	216.6	187.3	202.4
AvgD10	182.2	263.0	182.6	238.7	182.9	217.0	182.7	198.5	182.6	190.2
AvgQ4	156.1	234.2	158.8	216.1	161.2	200.4	163.5	187.4	165.9	177.4
SD	36.4	62.3	35.2	54.7	34.4	48.2	34.0	42.9	34.5	38.8
Min	51.4	52.5	52.4	55.0	53.4	57.3	54.3	57.2	55.1	56.5
AvgD1	62.8	60.6	63.8	61.7	64.0	62.8	64.2	63.5	64.2	64.0
AvgQ1	69.3	73.8	72.7	74.8	75.1	75.8	76.5	76.7	77.3	77.2
Panel B: Europe										
Mean	104.2	127.2	106.3	124.5	108.4	122.0	110.5	119.6	112.7	117.2
Median	89.0	115.4	89.2	105.8	90.2	102.8	88.0	99.8	88.4	97.1
Max	238.3	297.7	239.4	285.3	243.4	281.3	251.1	276.6	258.4	271.2
AvgD10	223.4	263.7	226.5	257.3	228.8	251.1	231.7	245.7	234.6	242.0
AvgQ4	197.6	217.4	199.5	214.4	201.1	212.6	203.1	211.0	205.5	209.4
SD	65.9	67.0	65.7	65.8	65.4	65.1	65.1	64.7	64.9	64.6
Min	16.8	21.6	17.3	21.1	17.7	20.6	18.2	20.1	18.6	19.6
AvgD1	21.0	32.1	22.0	31.2	23.0	30.2	24.1	28.9	25.3	27.7
AvgQ1	32.2	51.9	34.8	51.4	37.1	50.9	39.5	49.5	42.0	47.1
Panel C: World										
Mean	101.9	124.8	103.7	121.8	105.5	119.0	107.5	116.4	109.5	114.0
Median	83.9	126.4	84.3	122.0	84.0	122.4	89.0	120.7	95.7	108.4
Max	204.6	222.7	196.3	216.0	190.1	209.2	189.1	202.3	189.8	195.3
AvgD10	187.8	199.1	186.6	189.1	184.8	183.0	182.9	183.2	182.6	182.9
AvgQ4	170.7	181.5	170.2	172.2	169.5	166.6	168.5	164.4	167.5	165.0
SD	47.6	42.9	45.6	39.6	43.5	37.6	41.4	36.8	39.5	37.0
Min	42.5	55.6	43.8	54.4	45.2	53.1	46.5	51.9	47.9	50.7
AvgD1	45.2	63.1	47.7	62.8	50.2	62.1	52.7	61.1	55.3	59.7
AvgQ1	52.6	72.1	57.6	72.4	62.4	72.3	66.4	72.1	69.2	71.3

and its mirror, the median terminal wealth of the latter is more than 30% higher ($132.1 versus $101.5). In the case of the more extreme 100–0 strategy and its mirror, the difference in favor of the latter is more than 54% ($130.5 versus $84.6). Again, these differences in purchasing power are clearly substantial and relevant enough for investors to evaluate carefully.

The rest of the upside potential variables considered here—the highest terminal wealth (Max), the average terminal wealth in the highest decile (AvgD10), and the average terminal wealth in the highest quartile (AvgQ4)—all point in the same direction. They all favor the contrarian strategies, in some cases by a very substantial margin.

However, as already mentioned, the goal of lifecycle strategies is not to maximize expected terminal wealth, but rather to provide an acceptable balance between risk and return. Hence, it is essential to explore not only differences in the capital accumulated at retirement, but also differences in the risk borne by investors. The volatility (SD) figures in Exhibit 1 measure the variability of the final outcome (that is, uncertainty about the terminal wealth) across the 71 working lifetimes considered. As the exhibit shows, in all cases such variability is higher under contrarian strategies. In other words, contrarian strategies keep investors more uncertain about their terminal wealth than do lifecycle strategies.

It is important to notice that the volatility considered here measures uncertainty about terminal wealth, not uncertainty about the value of the portfolio during the holding period. The latter is more relevant for short-term investors, or those who often react to short-term volatility, which is not the case for the investor saving for retirement who is the focus of the analysis here. In any case, volatility measured at the end of the holding period and during the holding period generally point in the same direction. To illustrate, using the same sample considered here, Estrada [2013b] calculates both measures of uncertainty for stock and bond markets and finds that they virtually always yield the same conclusion about the relative risk of stocks and bonds.

That being said, volatility is but one measure of risk, and not necessarily the most plausible one, particularly when focusing on saving for retirement. Investors should and do also care about their performance in low-return scenarios. A natural question to ask, then, is this: How do investors fare during bad times by following any of the 10 strategies considered? And here the data begins to tell a different story about risk.

As Exhibit 1 shows, the lowest terminal wealth (Min) is in all cases lower with lifecycle strategies than with their respective mirrors. The differences are not large, but they are all in the same direction, and imply that although lifecycle strategies keep investors less uncertain about their terminal wealth than contrarian strategies, they do not necessarily provide them with more capital at retirement in worst-case scenarios. In fact, the opposite is the case.

Shifting the focus slightly from worst-case scenarios to merely bad scenarios does not affect the previous conclusion significantly. The average terminal wealth in the lowest decile (AvgD1) is in all cases higher under lifecycle strategies, but in no case by more than 4%. The average terminal wealth in the lowest quartile (AvgQ1) is in all cases but one (the 60–40 strategy and its mirror, and very marginally) higher under contrarian strategies, but again in most cases the differences are not large (less than 7%).

The fact that contrarian strategies have a much higher upside potential than, but similar downside potential to, lifecycle strategies suggests that the former's higher volatility is mostly upside risk; that is, uncertainty about how much higher, not how much lower, investors' terminal wealth is expected to be with contrarian strategies. This is an important consideration, often overlooked when comparing volatility figures, but it is particularly important here, given the positive skewness of all the distributions of terminal wealth.

In the case of the U.S., the evidence then suggests that contrarian strategies that feature glidepaths opposite to those of lifecycle strategies provide investors with a much higher upside potential and similar downside potential. In other words, contrarian strategies clearly have an edge over lifecycle strategies in terms of expected terminal wealth; whether lifecycle strategies have an edge in terms of risk, on the other hand, depends on whether investors assess it by focusing on volatility or on downside potential.

The evidence for the two regions considered, Europe and the world, confirms and in fact strengthens the previous conclusions. In all cases the mean and median terminal wealth of contrarian strategies are higher than those of lifecycle strategies. The former also outperform the latter when considering any of the other

three measures of upside potential (Max, AvgD10, and AvgQ4).[12]

In terms of volatility, however, it is not as clear as it is in the U.S. that contrarian strategies are more volatile than lifecycle strategies. In fact, the opposite is the case in three out of the five strategies considered in Europe, and in all five strategies considered in the world market. More importantly, the downside potential also favors contrarian strategies; this is the case both in Europe and in the world market, and for all the five strategies considered. In other words, the downside potential of contrarian strategies in worst-case scenarios (Min) and bad scenarios (AvgD1 and AvgQ1) is more limited than that of lifecycle strategies. In the world market, and on average across all five strategies considered, contrarian strategies provide investors with 18% (Min), 24% (AvgD1), and 18% (AvgQ1) higher terminal wealth than do lifecycle strategies.

Other Strategies

As already discussed, the 10 strategies considered so far, five lifecycle and five contrarian strategies, are symmetric on two counts: Their asset allocations evolve in opposite directions, mirroring each other, and they spend the same amount of time invested in stocks and bonds, only differing on when they do so. This section considers five additional strategies, none of which is symmetric (as just defined) with respect to the lifecycle strategies discussed in the previous section.

Three of the five strategies are fully invested in stocks over 40, 30, and 20 years; these strategies are respectively labeled 100 × 40, 100 × 30, and 100 × 20, and (for lack of a better name) referred to as equity-driven strategies. The first of these strategies is fully invested in stocks throughout the 40-year working lifetime; the other two are fully invested in stocks over 30 and 20 years, shift annually and linearly out of stocks and into bonds for the remaining 10 and 20 years, and finally end with a 50–50 stock–bond allocation one year before retirement. We chose this final allocation simply because it is what Vanguard target-date funds have at the retirement date.

The other two strategies considered in this section are balanced strategies, which aim to maintain a constant asset allocation. We consider two variations, the first maintaining a 50–50, and the second a 60–40 stock–bond allocation. Because these strategies are invested 50% and 60% in stocks over 40 years, they are respectively labeled 50 × 40 and 60 × 40. As is the case with all the other strategies considered in this article, the rebalancing (in this case, to maintain a constant asset allocation) is performed at the end of each year.

The first five columns of Exhibit 2 summarize the performance of the five strategies introduced in this section for the U.S. (Panel A), Europe (Panel B), and the world (Panel C). The last column of this exhibit (AvgLC) shows averages for the five lifecycle strategies considered in the previous section and shown in Exhibit 1.

As before, consider the case of the U.S. first. In terms of mean terminal wealth, the equity-driven strategies handsomely beat all lifecycle strategies. Note in the last column of Exhibit 2 that the average mean terminal wealth of the five lifecycle strategies is $110.5; hence, the 100 × 40 strategy provides a mean terminal wealth of more than twice as high [$223.5]. The differences in terms of median terminal wealth are just as substantial. The average median terminal wealth of the five lifecycle strategies is $100.6; hence, the 100 × 40, 100 × 30, and 100 × 20 strategies deliver roughly 88%, 85%, and 69% higher median terminal wealth. The rest of the upside potential variables (Max, AvgD10, AvgQ4) also show considerable differences in favor of the equity-driven strategies.

Predictably, equity-driven strategies keep investors more uncertain about their terminal wealth than lifecycle strategies do, as indicated by their higher volatility (SD). However, equity-driven strategies provide investors with a more limited downside potential, as measured by worst-case scenarios (Min) and bad scenarios (AvgD1 and AvgQ1). Hence, the higher variability of equity-driven strategies simply reflects more uncertainty about the upside potential; that is, how much better, not how much worse, investors are expected to fare with these strategies than with lifecycle strategies.

The evidence for Europe and the world market confirms all the results just discussed for the U.S. Equity-driven strategies clearly outperform lifecycle strategies in terms of mean and median terminal wealth, and more generally in term of upside potential. Furthermore, equity-driven strategies keep investors more uncertain about their terminal wealth, but given their more limited downside potential, this again reflects uncertainty about how much better, not how much worse, investors are expected to fare with them.

EXHIBIT 2
Terminal Wealth—Other Strategies

This exhibit shows summary statistics for five strategies evaluated over 71 overlapping 40-year periods, beginning with 1900–1939 and ending with 1970–2009. The strategies consider annual contributions of $1,000 in real terms. The first strategy (100 × 40) is fully invested in stocks for 40 years. The next two are fully invested in stocks for 30 (100 × 30) and 20 (100 × 20) years, then linearly shift out of stocks and into bonds, rebalancing at the end of each year, until they end with a 50–50 stock–bond allocation one year before retirement. The last two strategies (50 × 40 and 60 × 40) maintain a constant allocation to stocks (50% and 60%) over 40 years, rebalancing at the end of each year. The last column shows averages for the lifecycle strategies (AvgLC) considered in Exhibit 1. For each of the five strategies, the statistics describe the series that collects the terminal wealth across the 71 working lifetimes and include the mean, median, lowest (Min) and highest (Max) values, standard deviation (SD), average of the lowest decile (AvgD1) and quartile (AvgQ1), and average of the highest decile (AvgD10) and quartile (AvgQ4). The data are described in Exhibit A1 in the Appendix. All figures in thousands of dollars.

	100 × 40	100 × 30	100 × 20	50 × 40	60 × 40	AvgLC
Panel A: USA						
Mean	223.5	197.6	177.1	123.2	139.5	110.5
Median	189.0	185.9	170.2	118.0	133.1	100.6
Max	402.0	316.0	249.8	188.8	214.7	204.2
AvgD10	384.9	302.6	241.5	186.0	201.6	182.6
AvgQ4	351.5	280.4	232.5	170.7	189.7	161.1
SD	85.9	61.9	42.4	36.1	39.0	34.9
Min	98.4	101.7	103.3	55.8	67.7	53.3
AvgD1	117.7	109.4	114.6	64.2	76.5	63.8
AvgQ1	135.0	123.4	124.2	77.6	89.9	74.2
Panel B: Europe						
Mean	192.6	177.7	164.2	114.9	127.5	108.4
Median	200.5	192.4	165.7	93.3	110.1	89.0
Max	370.2	335.5	324.1	265.1	285.3	246.1
AvgD10	349.3	308.3	300.1	238.0	253.6	229.0
AvgQ4	304.0	280.7	269.7	207.6	224.1	201.4
SD	90.5	85.9	82.9	64.7	68.2	65.4
Min	25.1	22.7	21.4	19.1	20.3	17.7
AvgD1	37.5	32.1	29.5	26.4	28.7	23.1
AvgQ1	69.1	54.6	52.2	44.6	49.1	37.1
Panel C: World						
Mean	194.2	176.5	161.4	111.7	124.3	105.6
Median	187.5	185.4	173.3	102.2	122.9	87.4
Max	327.2	261.7	249.6	190.1	203.4	194.0
AvgD10	306.4	255.9	232.3	182.4	189.8	184.9
AvgQ4	289.2	242.8	213.7	166.3	175.0	169.3
SD	69.1	56.9	48.3	38.0	37.9	43.5
Min	65.8	58.0	56.3	49.3	52.9	45.2
AvgD1	84.1	71.0	66.2	58.0	63.7	50.2
AvgQ1	105.7	94.9	91.1	70.4	78.5	61.6

A comparison of the two balanced strategies considered here and the five lifecycle strategies already discussed also yields similar conclusions, with a few exceptions in Europe and the world. Exhibit 2, Panels B and C show that the 50 × 40 strategy has slightly lower volatility (uncertainty about terminal wealth) than the average lifecycle strategy, both in Europe and in the world market; the same is the case for the 60 × 40 strategy in the world market. Furthermore, the 50 × 40 strategy has slightly lower upside potential (Max, AvgD10, AvgQ4) than the average lifecycle strategy in the world market.

Except for these (largely minor) exceptions just noted, the rest of the results for the comparison between balanced and lifecycle strategies yield similar conclusions to those already discussed for the comparison between equity-driven and lifecycle strategies, which in turn are similar to those of the comparison between contrarian and lifecycle strategies. Overall, the two balanced strategies appear to be somewhat less aggressive than the contrarian and equity-driven strategies considered here.

A Comprehensive Sample

The results discussed so far provide an evaluation of lifecycle strategies relative to three types of strategies (contrarian, equity-driven, and balanced strategies) for the U.S., Europe, and the world. This section broadens the scope of the analysis by assessing the evidence from 19 countries, again including the U.S. Exhibit 3 reports averages across all 19 countries in the sample; Panel A focuses on lifecycle and contrarian strategies, and Panel B on equity-driven and balanced strategies. The country-by-country analysis is available in an additional appendix from *The Journal of Portfolio Management*'s website, or from the author upon request.

On average, across the 19 countries in the sample, the general results discussed in the previous two sections clearly hold. Contrarian, equity-driven, and balanced strategies provide investors with higher mean and median terminal wealth than lifecycle strategies; in some cases, such as with equity-driven strategies, the differences are substantial. These three types of strategies also have a higher upside potential than lifecycle strategies, in many cases by a considerable margin.

EXHIBIT 3

Terminal Wealth—Cross-Sectional Results

This exhibit shows summary statistics for 15 strategies evaluated over 71 overlapping 40-year periods, beginning with 1900–1939 and ending with 1970–2009. The strategies are those described in Exhibits 1 and 2. The last column of Panel B shows averages for the lifecycle strategies (AvgLC) considered in Panel A. For each of the 15 strategies, the statistics describe the series that collects the terminal wealth across the 71 working lifetimes and include the mean, median, lowest (Min) and highest (Max) values, standard deviation (SD), average of the lowest decile (AvgD1) and quartile (AvgQ1), and average of the highest decile (AvgD10) and quartile (AvgQ4). The data are described in Exhibit A1 in the Appendix. All figures in thousands of dollars.

Panel A	100–0	0–100	90–10	10–90	80–20	20–80	70–30	30–70	60–40	40–60
Mean	96.1	123.0	99.0	120.5	101.8	117.9	104.6	115.3	107.3	112.7
Median	74.6	104.2	76.9	102.0	79.8	99.4	83.1	95.9	86.1	92.6
Max	239.7	360.8	240.7	337.4	243.4	317.2	247.8	297.7	256.1	280.5
AvgD10	217.3	283.3	220.6	272.6	223.9	262.8	228.0	254.1	233.3	246.5
AvgQ4	182.0	221.3	185.6	215.9	189.1	210.9	192.5	206.6	195.9	202.8
SD	58.2	71.2	58.5	68.2	58.9	65.7	59.3	63.7	60.0	62.1
Min	30.8	33.6	32.1	34.2	33.0	34.7	33.7	34.9	34.2	34.9
AvgD1	35.3	43.5	37.1	43.7	38.5	43.6	39.8	43.2	40.9	42.7
AvgQ1	41.9	56.2	44.7	56.3	47.2	56.1	49.5	55.4	51.4	54.4

Panel B	100 × 40	100 × 30	100 × 20	50 × 40	60 × 40	AvgLC
Mean	177.3	161.9	150.9	110.0	121.8	101.8
Median	145.0	134.6	122.4	89.1	99.6	80.1
Max	530.1	398.2	375.7	267.1	306.4	245.5
AvgD10	417.9	355.2	333.9	239.6	268.3	224.6
AvgQ4	325.7	292.1	273.0	199.3	219.5	189.0
SD	106.3	90.7	85.1	60.9	67.4	59.0
Min	50.8	53.1	50.3	34.7	39.0	32.8
AvgD1	63.7	61.5	58.4	41.8	47.2	38.3
AvgQ1	80.1	75.7	72.1	53.1	59.3	47.0

It remains the case that contrarian, equity-driven, and balanced strategies keep investors more uncertain about their terminal wealth than do lifecycle strategies. But it also remains the case that the downside potential of these strategies is more limited. Hence, the higher variability is merely upside risk; that is, uncertainty about how much more, not how much less, terminal wealth investors are expected to have at retirement.

On average across the 19 countries in the sample, then, it is the case that, relative to the five lifecycle strategies, all 10 alternative (five contrarian, three equity-driven, two balanced) strategies considered here provide investors with 1) higher mean and median terminal wealth; 2) higher upside potential; 3) more limited downside potential; and 4) higher uncertainty about their terminal wealth, but are largely limited to how much better, not how much worse, investors are expected to fare with them.

ASSESSMENT

There is little question that target-date funds have been growing at a very fast pace and have become an extremely popular choice to save for retirement. And there are good reasons for this: these funds provide investors with a one-stop shopping alternative, broad diversification, and automatic periodic rebalancing without their active intervention, all of which are clearly beneficial. They also seem to make sense intuitively, exposing savings to higher risk when investors are young and more able to tolerate losses, and to lower risk when investors are older, have less desire to tolerate volatility,

and have less time to recover from losses. In short, lifecycle strategies are popular at least in part because they simply feel right.

However, despite their unquestionable benefits, it seems wise to ask whether investors could pursue better strategies, in the sense of leading them to have more capital at retirement, to bear a lower risk, or both. The comprehensive evidence discussed here, consistent with the limited previous literature on the subject, suggests that investors could do better with alternative strategies that are very easy to implement. Some, like balanced strategies, can be implemented simply by investing in a balanced fund, which are currently and widely available in the market.

The results discussed show that the simple alternative strategies considered here provide investors with greater expected wealth at retirement, and more generally higher upside potential, than lifecycle strategies. Although the former may increase investors' uncertainty about expected terminal wealth, given that their downside potential is more limited, the additional uncertainty largely reflects upside risk; that is, uncertainty about how much better, not how much worse, investors are expected to fare with these alternative strategies than with lifecycle strategies.

As is the case with many issues in finance, this controversy perhaps ultimately comes down to how risk is defined. Some investors may view the alternative strategies considered here as riskier than lifecycle strategies because, in general, they keep investors more uncertain about their terminal wealth. Some other investors may alternatively view lifecycle strategies as riskier simply because they are expected to underperform when it matters (at retirement) the alternative strategies discussed. Which strategy is riskier, then, depends on how each individual investor assesses risk.

In this regard, this comparison is not significantly different to that between a strategy that aims to maximize risk-adjusted returns and another that aims to maximize expected terminal wealth, or the rate of growth of the capital invested. Estrada [2010] and De Santiago and Estrada [2013] compare two strategies, Sharpe-ratio maximization (SRM) and geometric mean maximization (GMM), and ultimately find similar results to those discussed here when comparing lifecycle strategies to contrarian, equity-driven, and balanced strategies. More precisely, they find that GMM provides investors with higher terminal wealth and upside potential, a more volatile ride, and similar downside potential.

In general, because of their higher volatility, the alternative strategies considered here are more likely to surprise investors with a bigger drop by the end of an investor's working life than are lifecycle strategies. But, critically important, this potential higher drop should be more than offset by earlier larger gains. In other words, the better investment results accumulated over a working lifetime are likely to more than offset potential bad luck towards the end of the road. An investor following the alternative strategies discussed here may be knocked down more than another following a lifecycle strategy, but will fall from a higher place, thus ultimately being better off.

It is not for academics or practitioners to decide how investors assess risk, but both can help illuminate investors about the different ways in which risk can be thought of. Volatility and downside potential are two among many possibilities, and in the critical issue of how to best save for retirement, they lead to somewhat different conclusions about the relative costs and benefits of lifecycle and alternative strategies. In fact, as noted by Charlie Munger, Warren Buffett's partner at Berkshire Hathaway, "[If] you're investing for 40 years in some pension fund, what difference does it make if the path from start to finish is a little more bumpy or a little different than everybody else's so long as it's all going to work out well in the end? So what if there's a little extra volatility." (See Munger [1994]).

Despite the many unquestionable benefits of target-date funds, the alternative strategies considered here are easy to implement and very likely to provide investors with a bigger nest egg at retirement. They may leave investors somewhat more uncertain about how much better they will do relative to following a standard lifecycle strategy, but that seems to be an acceptable and even desirable risk for investors to bear.

APPENDIX

EXHIBIT A1

Summary Statistics

This exhibit shows, for the series of annual returns, the arithmetic (AM) and geometric (GM) mean return, standard deviation (SD), semideviation for a 0% benchmark (SSD), and lowest (Min) and highest (Max) return for all the stock and government bond markets in the Dimson-Marsh-Staunton (DMS) dataset over the 1900–2009 period. Individual country returns are real (adjusted by local inflation) and in local currency. Returns for Europe and the world market are real (adjusted by U.S. inflation) and in dollars. In all cases, returns account for both capital gains/losses and cash flows (dividends or coupons). All figures in %.

	AM	GM	SD	SSD	Min	Max
Stocks						
Australia	9.1	7.5	18.2	9.3	−42.5	51.5
Belgium	5.2	2.5	23.6	12.6	−57.1	109.5
Canada	7.2	5.8	17.2	8.5	−33.8	55.2
Denmark	6.7	4.9	20.7	8.9	−49.2	107.8
Finland	9.1	5.1	30.3	14.1	−60.8	161.7
France	5.7	3.1	23.5	12.6	−42.7	66.1
Germany	8.1	3.0	32.2	15.1	−90.8	154.6
Ireland	6.5	3.8	23.1	12.2	−65.4	68.4
Italy	6.2	2.1	29.0	15.8	−72.9	120.7
Japan	8.6	3.8	29.8	15.5	−85.5	121.1
Netherlands	7.1	4.9	21.8	10.4	−50.4	101.6
New Zealand	7.6	5.9	19.7	9.2	−54.7	105.3
Norway	7.2	4.1	27.4	11.9	−53.6	166.9
South Africa	9.5	7.2	22.5	9.2	−52.2	102.9
Spain	6.0	3.8	22.1	11.1	−43.3	99.4
Sweden	8.6	6.2	22.8	10.9	−43.6	89.8
Switzerland	6.1	4.3	19.8	10.3	−37.8	59.4
UK	7.2	5.3	20.0	9.9	−57.1	96.7
USA	8.2	6.2	20.3	10.6	−38.0	56.5
Europe	6.9	4.8	21.5	10.7	−46.6	76.0
World	6.9	5.4	17.7	9.4	−40.4	70.1
Bonds						
Australia	2.3	1.4	13.2	7.7	−26.6	62.2
Belgium	0.6	−0.1	12.0	8.3	−30.6	40.5
Canada	2.5	2.0	10.4	5.5	−25.9	41.7
Denmark	3.6	3.0	11.6	5.1	−18.2	50.1
Finland	1.0	−0.3	13.7	11.1	−69.5	30.2
France	0.7	−0.2	13.0	9.7	−43.5	35.9
Germany	0.7	−2.0	15.6	12.7	−95.0	62.5
Ireland	2.1	1.1	14.6	7.9	−34.1	61.2
Italy	−0.4	−1.6	14.1	11.9	−64.3	28.7
Japan	1.5	−1.2	20.1	15.0	−77.5	69.8
Netherlands	1.8	1.4	9.4	5.2	−18.1	32.8
New Zealand	2.4	2.0	9.0	4.9	−23.7	34.1
Norway	2.4	1.7	12.2	7.0	−48.0	62.1
South Africa	2.2	1.7	10.4	5.9	−32.6	37.1
Spain	2.0	1.4	11.7	7.0	−30.2	53.2
Sweden	3.2	2.5	12.4	6.1	−36.7	68.2
Switzerland	2.5	2.1	9.3	4.3	−21.4	56.1
UK	2.2	1.3	13.6	7.2	−30.7	59.0
USA	2.4	1.9	10.1	5.3	−19.4	35.1
Europe	2.0	0.8	15.3	9.3	−44.9	65.7
World	2.2	1.7	10.3	5.6	−27.1	31.7

ENDNOTES

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[1]Assets in target-date funds have grown from $71 billion at the end of 2005 to $378 billion at the end of 2011; see Charlson and Lutton [2012]. Growth in these funds took off when they became a qualified default investment alternative [QDIA] with the passage of the Pension Protection Act of 2006.

[2]Watson Wyatt [2009] points out in a report on lifecycle strategies that it is "worth noting that the lifecycle concept has never pretended to try to achieve the maximum possible savings growth for an individual … Lifecycle is not designed to maximize returns, but rather to balance risk and return … It seeks to reduce risk as the capacity of the member to take risk diminishes. …"

[3]In a survey of 540 defined contribution plan participants run in September 2011, ING found that 80% of target-date fund users preferred "stronger protection against investment losses near and in retirement" rather than "stronger potential for investment gain;" see ING Retirement Research Institute [2012].

[4]To illustrate, Vanguard maintains a 90% equity exposure through age 40 (the remaining 10% being allocated to investment-grade bonds), steadily declines to a 30% equity exposure through age 72 (the rest being allocated 45% to investment-grade bonds, 20% to TIPS, and 5% to cash), and keeps the asset allocation constant from that point on. See Donaldson et al. [2012].

[5]A well-known implementation of this aspect of time-diversification is the '100−Age' rule of thumb. This rule suggests that an investor who splits a portfolio between stocks and bonds should have an exposure to bonds roughly equal to his age, and an exposure to stocks roughly equal to 100 minus his age. Hence, a 30-year old investor should invest 30% in bonds and 70% in stocks, and a 65-year old investor should invest 65% in bonds and 35% in stocks.

[6]Samuelson [1994] admits that a shrinking holding period calls for lowering the exposure to risky assets in three settings. First, when returns are mean-reverting and investors are more risk averse than indicated by a log utility function; second, when investors have a subsistence level of terminal wealth they wish to attain; and third, when human capital plays a role in investment decisions. This last setting was originally considered by Bodie, et al. [1992] and has become a widely accepted justification for strategies that get more conservative as investors approach retirement.

[7]Earlier work by Hickman et al. [2001] reaches similar conclusions. They assess portfolios with different types of U.S. bonds and stocks, find that investors that decrease the risk of their portfolios over time suffer "huge penalties" in terms of accumulated savings, and conclude that for investors with holding periods longer than 20 years, any asset other than stocks offers little benefit in terms of risk reduction and substantially less expected wealth. Although Hickman et al. [2001] discuss their results within the general framework of lifecycle investing, periodic contributions do not play a role in their results; rather, their discussion is more akin to that of the time-diversification literature.

[8]In private correspondence, Rob Arnott emphasized the fact that lifecycle strategies create valuation-indifferent demand for bonds as investors approach retirement, which may be particularly damaging when nominal yields are very low, and real yields are negative, as they were in early 2013. Although this is true, it could also be argued that contrarian strategies create valuation-indifferent demand for stocks as investors approach retirement, which may be particularly damaging when stocks are grossly overvalued, as they were at the end of the 1990s.

[9]Ayres and Nalebuff [2010] and Shiller [2005] broaden their discussion beyond the U.S. with a glimpse of international evidence, and Booth and Yakoubov [2000] base their analysis on evidence from the U.K.

[10]There is of course more than one way to model the pattern of contributions. Arnott [2012] considers a constant contribution of $1,000 in real terms, just as is done here. Basu and Drew [2009] consider an investor who has a starting salary of $25,000, saves 9% of her annual salary, and expects the latter to increase at the annual rate of 4%; hence, they consider nominal savings indexed (roughly) by inflation and therefore (roughly) constant in real terms. Shiller [2005], on the other hand, considers a hump-shaped pattern in savings, with contributions peaking in the middle years of the saver's working life. In short, there is no agreement in the literature regarding the most plausible pattern of contributions, but different patterns are unlikely to affect the major conclusions drawn from the analysis here.

[11]This is because the probability of obtaining at least the *median* terminal wealth is 50%, and in a distribution with positive skewness the mean is higher than the median.

[12]The only very minor exceptions to this statement are in the world market; the 20–80, 30–70, and 40–60 strategies have slightly lower terminal wealth in the highest quartile, and in the 20–80 strategy in the highest decile, than their mirrors. That being said, in all three cases the differences are less than 3%.

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