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USING PARTICIPANT DATA TO IMPROVE 401(k) ASSET ALLOCATION

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Introduction

Economic theory says that participants in 401(k) plans should gradually rebalance their portfolios away from stocks towards less risky bonds as they approach retirement. The rationale is that at younger ages households hold a substantial portion of their wealth in the expected present value of their remaining lifetime earnings, which are generally viewed as a relatively low risk asset, so they should hold much of their financial assets in high risk/high return stocks. As households approach retirement, the value of the earnings asset declines, so they should compensate by rebalancing their investment portfolios away from stocks and into bonds.[1]

Many households fail to rebalance their portfolios as they age, reflecting both inertia and lack of investment skills. In response, 401(k) plans offer life-cycle, or target date, funds which automatically rebalance the household's portfolio with age. Conventional target date funds take into account only one aspect of an individual – namely, the person's expected retirement date. In fact, the plan provider knows additional information about the individual, including his earnings, the balance in his 401(k) account, and his saving rate. This *brief* compares how much a conventional ("one-size-fits-all") target date fund improves the outcome compared to the asset allocation that individuals would choose on their own and how much taking into account the additional information improves the outcome compared to the one-size fits-all target date fund.

This *brief*, adapted from a new paper, proceeds as follows. The first section establishes the benchmark – expected lifetime utility from an optimal investment strategy – against which each 401(k) investment option is compared. The second section describes the horse race in which the outcomes for each of the three allocation approaches are compared to the benchmark. The third section suggests two additional adjustments – basing portfolios on estimated *household* characteristics rather than relying solely on participant data and taking into account the riskiness of the participant's earnings – that would bring outcomes closer to the optimal. The final section concludes that a target date fund is better than leaving the household on its own and that adding information to the one-size-fits-all target date fund can bring the outcome even closer to the optimal for the great majority of households.

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The Benchmark

Comparing alternative approaches to asset allocation requires a benchmark. The approach taken in this study is to use numerical optimization techniques to model optimal savings and asset allocation.[2] The household's goal is to maximize the expected discounted utility of lifetime consumption. The household faces three types of uncertainty. The first is labor income uncertainty. While the model abstracts from the risk of unemployment, it does incorporate unpredictability in year-to-year earnings. The second is financial market uncertainty. In the model, households can invest in a risk-free bond yielding a 3-percent real interest rate or in risky stocks with real returns that fluctuate around 6.5 percent.[3] The third is longevity uncertainty; the household does not know precisely how long each member will live.

The model allows for alternative levels of risk aversion, various retirement ages, and high and low levels of earnings uncertainty. The model also incorporates Social Security benefits and Social Security and federal income taxes, including the taxation of Social Security benefits and 401(k) withdrawals.

Once the model is constructed, the first step is to estimate it with fully optimizing behavior for the typical *household*. In each period, starting at age 22, the household chooses how much to consume and how much to save and how to allocate its portfolio between risky stocks and a risk-free bond. The results vary by the household's degree of risk aversion, the level and uncertainty surrounding its earnings, and its expected retirement age. The results for the base case reported below assume that the household is relatively risk averse, has an average level of earnings uncertainty, is starting at age 22 with zero wealth, and retires at 65.[4]

The Horse Race

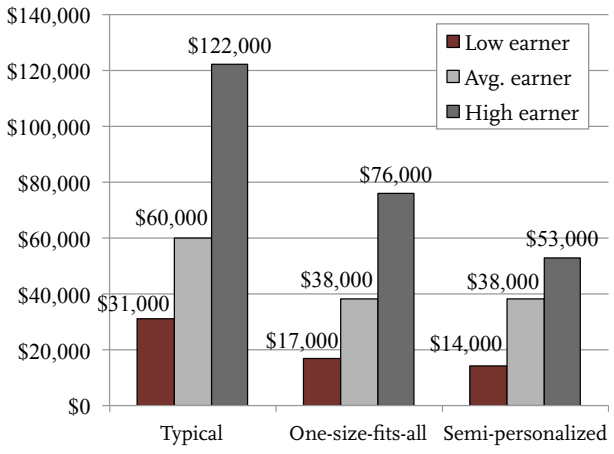
The model is then re-estimated under three scenarios, in which the individual is constrained to invest in: 1) the portfolio held by the typical household; 2) a one-size-fits-all target date fund; and 3) a semi-personalized target date fund that takes into account the individual's earnings, 401(k) balance, and saving rate. In each case, the model yields an expected utility of lifetime consumption, which can be compared to the utility of the consumption produced by the optimal portfolio. The semi-personalized and one-size-fits-all portfolios are constructed using the same coefficient of risk aversion used to construct the optimal portfolio.[5] The measure used for comparing how the alternatives stack up is the percentage increase in annual salary that the household would require to be indifferent between the specified portfolio and the optimal portfolio and the amount to which that increase would grow by age 65.

The key fact to keep in mind is that the benchmark results are for the *household* and based on the *household's* information, but the portfolios for the one-size-fits-all and the semi-personalized alternatives in the horse race described below are based on information about the *participant*, which is the only information available to the plan provider.

The Typical Portfolio

For the first horse, the household is given a typical portfolio allocation for each year's contributions, but does not rebalance its existing portfolio in response to realized returns.[6] The household is allowed to select an optimal saving rate, given its portfolio allocation. The results are used to calculate the percentage salary increase that the household would require to be indifferent between the typical and the optimal portfolio allocation, and the average amount that this percentage of salary would grow to by age 65. The analysis includes three prototypical households with different levels of earnings. The average earnings, $91,000, are for a two-income, college-educated couple, the type of household most likely to have 401(k) coverage. The low-earnings household makes half of the average amount and the high-earnings household makes twice the average amount.

Figure 1. Compensation Required for Adopting Alternatives to an Optimal Portfolio, by Earnings



Source: Authors' calculations.

Given the baseline assumptions, the household with average income would require a 0.79-percent increase in salary as compensation for investing in the typical portfolio compared to the optimal strategy. Although this number may at first appear small, if it were set aside and invested each year, it would grow to $60,000 by age 65 (see Figure 1 on the previous page).[7] A high-earner household would require a similar percentage increase in salary (0.80 percent), but the cumulative amount would equal $122,000 at age 65.

A One-Size-Fits-All Target Date Fund

The second horse is a one-size-fits-all target date fund. According to the life-cycle model, households should gradually rebalance from stocks to bonds as they age, reflecting the declining value of their human capital. Thus, the plan provider will design a fund that gradually reduces the share of equities in the portfolio. The portfolio will be derived from a model similar to the benchmark discussed above and would be – by design – optimal for the average household, had the allocation been based on *household* information. However, as noted, the plan provider only knows the earnings of the individual, so the portfolio allocation is somewhat suboptimal even for the average household. In almost all cases, the one-size-fits-all portfolio is closer to the optimal than the typical portfolio, reflecting the benefits of adjusting portfolio allocation over the life-cycle.

A Semi-Personalized Target Date Fund

The third horse is a semi-personalized target date fund that reflects information known to the employer: the participant's earnings, plan balance, and saving rate. With this additional information, the semi-personalized strategy would be optimal at each income level if the allocation had been based on the *household's* information. But given that it reflects only the participant's earnings, 401(k) assets, and saving rate, households remain in a suboptimal position and require some compensation. For a household that has precisely the average income, by definition, the semi-personalized portfolio performs just as well as the one-size-fits-all target date fund. For most other households, the semi-personalized portfolio is closer to the optimal than the one-size-fits-all target date fund.

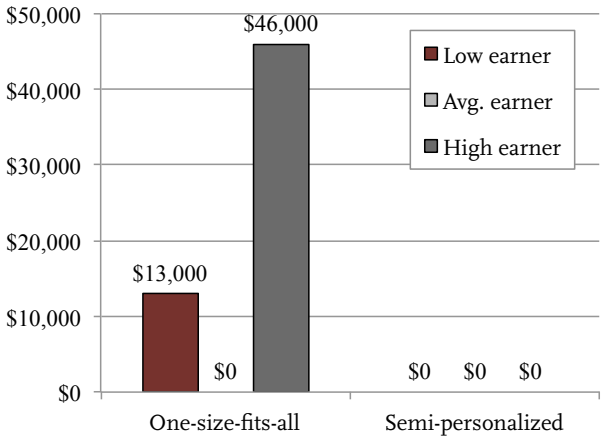
Improving the Results

Two considerations could improve the performance of even the semi-personalized target date fund. The first is to base the asset allocation on estimated household information rather than simply on what is known about the participant. The second is to take earnings uncertainty explicitly into account.

Individual versus Household

The above calculations assume that the employer observes only the participant's income and 401(k) plan balance and has no information regarding his spouse's income and 401(k) plan balance or the household's non-401(k) financial assets. However, this problem could be mitigated by using the Federal Reserve's *Survey of Consumer Finances* to predict household income and assets based on the participant's income, 401(k) plan balance, age, gender, marital status, and job tenure, all of which is known to the employer. Building this information into the methodology presented above brings the allocations closer to the optimal outcome for both types of target date funds. Under the assumptions, if the employer is able to predict the household's income, the semi-personalized portfolio is perfectly optimal for households at all earnings levels (see Figure 2).

Figure 2. Compensation Required for Adopting Target Date Alternatives (Based on Household Earnings) to an Optimal Portfolio, by Earnings

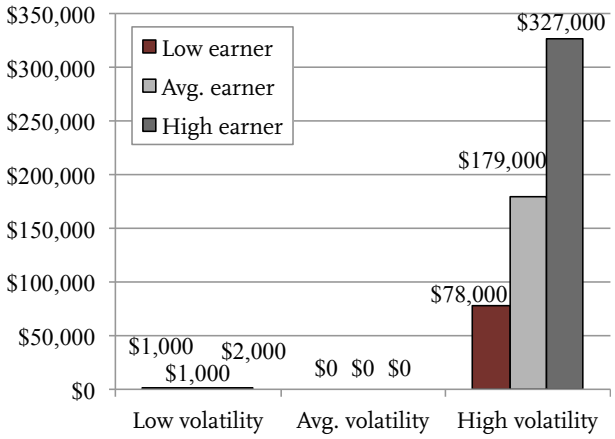


Source: Authors' calculations.

Earnings Risk

The optimal portfolio allocation also depends on the riskiness of the household's earnings. Participants who work for public utilities and have secure earnings can take on more risk in their 401(k) portfolio than those who work for an Internet startup. Figure 3 shows the compensation required for the semi-personalized approach by earnings level and by degree of earnings uncertainty. As before, the semi-personalized approach is optimal for households with average earnings uncertainty at all income levels. It is also close to optimal for those with below average earnings uncertainty, because their optimal portfolio is similar to that of households with average earnings uncertainty. In contrast, the semi-personalized approach is far from optimal for households with more earnings uncertainty.[8] These losses could be eliminated by estimating labor market risk by firm and adjusting the recommended asset allocation accordingly.

Figure 3. Compensation Required for Adopting a Semi-Personalized Portfolio Based on Household Earnings, By Earnings and Earnings Uncertainty



Source: Authors' calculations.

Conclusion

Many households fail to rebalance their 401(k) assets as they age, which is at odds with the guidance provided by economic theory. In response, a large number of 401(k) plans now offer target date funds, which automatically rebalance portfolios. The target date approach is a clear improvement over leaving participants on their own. However, conventional target date funds follow a one-size-fits-all approach that accounts only for each worker's expected retirement date. This *brief* shows that a semi-personalized target date fund, which also incorporates information on a worker's earnings, 401(k) account balance, and saving rate, generally outperforms the one-size-fits-all fund by more closely matching an optimal portfolio. These results can be improved even further by including information on the *household* rather than simply the individual participant and by taking into account the household's earnings uncertainty.

Endnotes

1 Jagannathan and Kocherlakota (1996).

2 See Li and Webb (2012) for a more detailed description of the methodology and results.

3 Although bonds are a risky asset in a single period model, Campbell and Viceira (2002) argue that they are the true risk-free asset in the long run because they offer a guaranteed return on capital.

4 The household's assumed coefficient of relative risk aversion (CRRA) is 5. For a discussion of plausible CRRAs, see Chetty (2003).

5 Both one-size-fits-all and semi-personalized portfolio allocations could reduce household well-being if they were based on incorrect estimates of household risk preferences.

6 The portfolio allocation for each year's contributions results in average portfolio allocations at retirement that match the average in the *Survey of Consumer Finances* for households age 55-64 in their income tercile. Mitchell et al. (2006) show that 401(k) participants rarely rebalance their portfolios.

7 The assumed rate of return is the risk-free rate.

8 The standard deviation of the earnings shocks of the low-volatility households is defined as zero, and that of the high-volatility households is twice the average. When households do not face any labor income uncertainty, it is optimal to hold slightly more in equities. When they face higher volatility, they optimally hold substantially less in equities.

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