

Lifecycle Investment Decisions and Labor Income Risk

BY LUCA BENZONI AND ROBERT GOLDSTEIN

The optimal proportion of financial wealth placed in stocks versus risk-free bonds changes over an investor's life and is very sensitive to the long-run correlation between stock returns and labor income. If this correlation is assumed to be high, then the optimal proportion of stock is hump-shaped and approximately zero for young agents, in contrast to the claims of financial advisers and most academic models.

Lifecycle investment decisions are based on the principle that optimum asset allocation changes over the course of an investor's life. Yet, there remains a significant discrepancy between commonly recommended strategies and investor practices. Financial advisors and much of the academic literature argue that young investors should place most of their savings in stocks, which historically have paid a high risk premium relative to U.S. Treasury securities, and switch to less risky assets as they age. For instance, Malkiel (1996) recommends putting a percentage of assets equal to the number 100 minus an investor's age in a well-diversified portfolio of stocks. But research shows that a significant fraction of U.S. households do not hold equities. Moreover, lifecycle risky asset holdings are "hump shaped." Young investors typically hold very little stock, progressively increase their risky assets holdings as they age, and decrease their exposure to stock market risk when they approach retirement (see Ameriks and Zeldes 2001 and Campbell 2006). We refer to these patterns as a limited stock market participation puzzle.

This *Economic Letter*, which draws on Benzoni, Collin-Dufresne, and Goldstein (2007), discusses the role of labor income risk in explaining lifecycle asset allocation decisions. The *Letter* argues that the correlation between shocks to stock market returns and wages is an increasing function of the investment horizon. For a young investor, this effect generates a large positive correlation between stock returns and the unobservable return to human capital. That is, the present value of future labor income flows acquires "stocklike" features in that returns can be volatile and unpredictable. However, older investors, who have shorter times to retirement, are much less exposed to long-run labor income risk. Hence, their remaining human capital becomes more "bondlike" in that returns are stable and highly predictable. Together, these effects create a hump-shaped optimal portfolio decision over the investor's lifecycle, consistent with empirical observation.

Portfolio choice with nontradable labor income

For most people, labor wealth, that is the present value of future wages, dwarfs financial wealth. It is therefore important to account for labor income risk when making lifecycle portfolio decisions. Empirically, it has been found that the flow of labor income is well represented as a sum of three

components: an aggregate component that is subject to economy-wide fluctuations; an idiosyncratic component, which captures individual specific shocks; and a deterministic component due to lifecycle predictability in wages.

Much work has gone into studying the properties of labor income using micro-level data (see Carroll and Samwick 1997, Cocco, Gomes, and Maenhout 2005, and Gourinchas and Parker 2002). Several qualitative features of the data are universally understood. First are two types of idiosyncratic shocks: transient and persistent. Second, wages tend to increase with age when workers are young and then decline when they approach retirement, creating a hump-shaped deterministic lifecycle labor income profile. However, the properties of the *aggregate* labor income component, and in turn, the associated implications for portfolio choice, are more controversial.

Contemporaneous correlations between aggregate labor income shocks and stock market returns are typically estimated to be low. Prior studies that accounted for this feature when examining lifecycle portfolio choice found that young investors subject to labor income risk would hold much of their financial wealth in risky assets because, in these models, both aggregate and idiosyncratic labor income shocks are not related to stock market fluctuations (see Cocco, Gomes, and Maenhout 2005, Gomes and Michaelides 2005, and Viceira 2001). As such, young investors find it optimal to diversify labor income risk by buying more risky assets.

It's important to note that the model specifications of these prior studies force long-run correlations between aggregate labor income shocks and stock market returns to be as low as short-run correlations. Under this assumption, the correlation between labor income and stock market returns is small, in turn generating bondlike properties for human capital. It is natural to relax this restriction. Intuitively, a high value of long-run growth in GDP is likely to result in significant increases in both labor income and stock returns. Along these lines, Baxter and Jermann (1997) consider a model in which aggregate labor income and GDP growth move together over the long run, while Benzoni, Collin-Dufresne, and Goldstein provide evidence consistent with aggregate labor income tracking stock market portfolio dividends.

Consistent with the studies cited above, Benzoni and coauthors also construct their model so that short-run dividends and labor income correlations are low, consistent with the data. However, they specify that dividends and labor income are *co-integrated*, that is, they move together in the long run. They then explore the combined effects of idiosyncratic labor income shocks and co-integration on lifecycle portfolio choice. For reasonable calibrations of the model parameters, the co-integration effect prevails when an investor is young. That is, changes in the present value of the claim to future labor income are highly correlated with stock market returns. As such, long-run labor income risk overexposes individuals to stock market risk. Since most of young investors' wealth is tied up in future labor income, they prefer to invest their financial wealth in risk-free assets. In fact, absent short-selling constraints, they actually choose to take a short position in the stock market, in spite of its large expected returns compared with Treasury securities. However, as investors age, co-integration has less time to act, so its effect fades away. Thus, when they age, investors find it optimal to diversify away idiosyncratic labor income shocks by increasing the portfolio share of stocks. That is, their human capital acquires bondlike properties. Finally, when these individuals approach retirement, human capital shrinks to zero. Thus, the effect of idiosyncratic labor income shocks fades away too and investors reduce their risky asset holdings. Taken together, these effects result in a hump-shaped lifecycle portfolio decision, consistent with empirical observation.

Robustness of the results

Benzoni, Collin-Dufresne, and Goldstein document that the hump-shaped portfolio profile and young investors' desire to hold no stock fit well with several economically plausible calibrations. For instance, the results hold when the equity premium ranges from 4% to 6% per year. Moreover, the main conclusions hold even if co-integration between dividends and labor income is hardly detectable in the data. Increasing the variance of permanent idiosyncratic labor income shocks to the upper end of the empirical range generates a higher incentive to diversify away individual labor income risk by holding more stock. But this result does not entirely offset the effect of co-integration when the investor is young. Related to this, transient idiosyncratic shocks do not have any significant impact on lifecycle investment decisions. Finally, the hump-shaped investment profile holds even if the model is constructed to capture the empirical observation that long-term stock market risk is lower than short-term risk.

However, the results are sensitive to investor attitudes towards risk. Benzoni and coauthors find that, even at a young age, if an investor is *moderately* more risk tolerant than the investor considered in the base case, then he or she will find it optimal to invest heavily in stock in spite of the long-run co-integration effect. This is an appealing feature of the model, since in practice there is significant heterogeneity in stock market participation. Most other models cannot capture this heterogeneity without assuming *extreme* differences in attitudes toward risk among investors.

Other implications if dividends and labor income are co-integrated

Benzoni and coauthors demonstrate that accounting for large long-run correlations between labor income and dividends dramatically affects optimal investment decisions. Moreover, work by such researchers as Geanakoplos and Zeldes (2007) and Lucas and Zeldes (2006) underscores the importance of long-run labor income risk in other fundamental applications, including the valuation and hedging of Social Security and defined-benefit pension plan obligations. Future retirement payments are typically linked to the tenure of employment and earnings in the final years of employment. Thus, the appropriate rate at which to discount uncertain future payments depends on the risk associated with labor income wages. For young investors, such risk embeds a long-run component which increases the discount factor and thus reduces the present value of future obligations. Similarly, the optimal strategy to hedge the market risk associated with pension liabilities depends on a number of factors, including worker characteristics. In particular, the younger the pool of workers covered by a pension plan, the more the pension liabilities will be exposed to long-run labor risk, which will make the position highly exposed to stock market risk. Thus, a higher fraction of the hedging portfolio should be invested in stocks.

Conclusion

Recent studies have provided many alternative explanations for the limited stock market participation puzzle (see Campbell 2006 and Curcuru et al. 2010 for excellent reviews of the literature). The explanation offered here is not a substitute for previous theories, which also have economic appeal and empirical support. This work complements prior contributions by showing that long-run labor income risk has a first-order effect on optimal asset allocation over the lifecycle. Moreover, this long-run labor income risk has important implications for issues such as the valuation and hedging of Social Security and defined-benefits pension plan obligations.

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