

Stocks and Bonds over the Life Cycle

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Conventional wisdom holds that investors, as they age, should shift away from equities and toward bonds. This prescription is sometimes justified by questionable claims about lower risk from longer-term stock ownership. Another rationale stresses that stocks are riskier than bonds and that older investors have less tolerance for risk. Lower risk tolerance for older investors makes sense, if they have less ability to recover from a disastrous financial shock by working harder and longer.

In contrast to conventional wisdom, the standard theory of portfolio allocation does *not* recommend that investors shift toward bonds as they age. Standard theory holds that the optimal portfolio is a combination of a broadly diversified equity fund and safe, risk-free securities. The optimal share of equity in the portfolio depends on the investor's risk aversion, according to standard theory, but not his or her age. This prescription for an equity share that is constant with respect to age emerges from a theoretical framework that ignores labour income.

In reality, labour income accounts for about two-thirds of national income, and human capital is the largest component of wealth for many workers and households. Human capital refers to the productive energy and skills that a worker brings to the labour market. The value of human capital derives from the current and future labour income that the worker expects to earn. Because future labour earnings are uncertain, human capital is a risky asset.

Recent research on portfolio allocation and asset pricing incorporates a major role for risky labour income into the standard theory. This new approach recognizes two key facts. First, dividends *and* wages affect consumption and portfolio decisions. Second, the share of wealth in the form of human capital declines over the life cycle as a worker ages. We have pursued this life-cycle human capital approach with academic colleagues George Constantinides, John Donaldson and Paul Willen. In this article, we apply the approach to draw some important lessons about portfolio allocation and asset pricing. We first consider portfolio allocation. We then turn to asset pricing and explain how the life-

cycle perspective helps to understand the “equity premium puzzle”, discussed in part three of Mastering Investment.

Portfolio allocation

Younger and middle-aged households have large, illiquid claims on income streams that flow from human capital and small business ownership. The claims are illiquid because they cannot readily be traded in capital markets in the same way as stocks and bonds. The wealth value of these income streams fluctuates with news about wages and employment (for workers) and profits (for small business owners). In addition, the value of this human capital naturally decreases with age for workers and for most business owners. As retirement draws closer and fewer years of work remain, the value of expected future labour income declines, eventually reaching zero.

To see how these facts matter for portfolio choice, start from first principles. From an investor’s perspective, the desirability of an equity security depends on the relationship between the investor’s future consumption and the future returns on the security. If the security is likely to pay off handsomely when consumption is low, the investor will look more favourably on it. Why? Because the marginal utility of consumption – the incremental improvement in well-being from a unit increase in consumption – varies inversely with the level of consumption. So, an investment that pays off handsomely when consumption is high is less valuable, other things equal, than one that pays off handsomely when consumption is low.

Imagine a security that pays high returns in circumstances that also put the investor’s job in jeopardy. For example, an energy crunch is often good news for oil company stock returns but bad news for workers who make and sell gas-guzzling, luxury automobiles. For such worker-investors, oil stocks tend to pay off well when labour income and consumption are low, and the marginal utility of consumption is high. Hence, in this example, oil stocks are relatively attractive investments for workers in the auto industry.

Risky Human Capital

This line of thinking has important implications for portfolio choice. In particular, investors should structure their portfolios with due regard for the relationship between asset returns and shocks to the value of risky human capital. Other things being equal (such as expected returns, tax consequences and transaction costs), worker-investors should curtail or eliminate exposure to risky financial assets that do well in times of good news about their own labour income and raise exposure to financial assets that do well in times of bad news about own income. This principle is more precisely expressed using the concept of “covariance”, which measures how closely two variables move together. That is, investors should load up on risky securities that have a negative covariance with the value their own human capital and shy away from securities that have a positive covariance.

The intelligent exercise of this principle requires solid information about the relevant covariances. Sometimes the requisite knowledge is evident, as for an executive who holds a large restricted equity investment in the company for which he works. Clearly, this manager has much illiquid wealth tied up in a form that does well precisely when the company stock performs well. He is well advised to structure the discretionary parts of his portfolio to offset this high exposure to company stock.

More often than not, however, the requisite knowledge is not evident. Consider a 40-year-old steelworker. What is the relationship between the value of the steelworker’s human capital and equity returns at the aggregate, industry and company level? In principle, careful empirical research can uncover the requisite knowledge by investigating the covariance between the returns on financial assets and the value of human capital. Unfortunately, research in this area has only begun to provide an empirical foundation for better portfolio choice.

Research to date offers two messages. First, the correlation between equity returns and the value of human capital rises with the education level of the worker. Available evidence suggests that this relationship to education holds for aggregate equity returns, own-industry equity returns and, perhaps, own-company returns as well. This evidence resonates with the view that the financial interests of capitalists are more closely aligned with highly educated professional workers than with less-educated, blue-collar workers. The portfolio implication that follows from this evidence is that less educated workers should hold a larger fraction of financial wealth in aggregate and own-industry equity than otherwise similar workers with more education.

Second, and contrary to the views of many, it need not be foolish or risky for a worker-investor to hold stock in his own company or industry. Both economic theory and empirical evidence suggest that this portfolio strategy reduces risk for some workers.

To see why, consider the steelworker again. If the ups and downs of steel stocks mainly reflect shocks to the demand for steel, then capital and labour rise and fall together. In this case, the steelworker is well advised to curtail exposure to steel industry stocks and other financial assets that move in sympathy. However, if the ups and downs of steel stocks are dominated by developments that shift the relative demand for capital and labour - such as labour-saving technological innovations or wage-bargaining conflicts that alter the division of a fixed pie - then equity returns covary negatively with the value of human capital. In this case, the steelworker is well advised to load up on steel stocks.

To recap, bringing risky human capital into financial theory yields a clear principle for portfolio choice, but one that requires a strong empirical foundation for its application. As yet, our knowledge about the covariance between asset returns and the value of human capital is sketchy. Better information in this regard offers potentially big rewards – for savvy worker-investors and for society at large. Pension fund management, mutual fund design, the creation of new securities and institutions that support individualised social security accounts could all be improved by better knowledge of the covariance between asset returns and the value of human capital.

Ageing advice

What does this analysis imply about portfolio allocation over the life cycle? In particular, does it support the prescription that investors should shift toward bonds as they age? Yes, but only under conditions that apply to some, not all, workers, and for reasons quite distinct from those put forth by the conventional wisdom on ageing and portfolio allocation.

To see the logic, consider two 40-year-old investors: a tenured professor of history at a financially sound college and a factory worker for an auto company. Labour income has quite different risk characteristics for these investors. The professor can anticipate a very stable earnings path until retirement, with considerable protection against firing and salary cuts. His labour income path shares much in common with the cash flows generated by a long-term coupon bond.

The factory worker faces a different prospect. The auto industry is highly cyclical, tending to rise and fall with the aggregate economy. When new car demand drops off in a cyclical downturn, the factory worker faces the threat of layoff or cutbacks in hours. A downturn might also precipitate an early retirement. In contrast, a cyclical upswing sharply lessens layoff risk and may bring heavy overtime and a big jump in earnings. In this regard, it is important to observe that the stock market also tends to rise in cyclical upswings and fall in cyclical downturns. Hence, the labour income path for an auto factory worker shares much in common with the returns generated by a broad-based equity fund.

In short, by virtue of his job, the factory worker implicitly holds an “asset” – human capital - that is much like equity. The tenured history professor implicitly holds an asset that is much like a bond. More generally, think of a worker-investor’s *total* portfolio as the sum of financial holdings plus the holdings implicit in his human capital.

Thus, for a tenured history professor, ageing involves a gradual reduction in human capital that progressively reduces an implicit position in bonds. In consequence, it makes good sense for the professor to offset the reduction in human capital by gradually increasing the share of bonds in his portfolio of financial assets. But, for an auto factory worker, ageing involves a reduction in human capital that progressively lowers his implicit position in equity. Hence, it makes good sense for the factory worker to offset the drop in human capital by gradually increasing the share of equity in his financial portfolio.

The general principle is now clear: investors should re-balance their financial portfolios as they age so as to maintain a properly balanced total portfolio, which includes the value of human capital. For some worker-investors, this principle requires a declining share of financial wealth in equities, but for others it requires an increasing share. So, conventional wisdom gives the right prescription for some, but not all, workers.

There is another problem with the conventional wisdom. Once a worker retires, he no longer earns a return on human capital, so the rationale for re-balancing his financial portfolio toward bonds (or equities) no longer holds. Yet financial planners routinely recommend that retirees continue to shift portfolio investments into bonds as they age. In this regard, the conventional wisdom about ageing and portfolio composition is a prescription in search of a principle.

Equity premium puzzle

A life-cycle perspective also helps understand the celebrated equity premium puzzle, covered in last week's issue. To recap, average stock returns have greatly exceeded average bond returns over recorded financial history. Adjusted for inflation, the average annual return on the US stock market in the past 110 years has been a healthy 7.9 per

cent. Over the same period, the real return on comparatively safe securities like government bonds was a paltry 1 per cent. The difference of 6.9 per cent is the “equity premium”. It is puzzling because it defies easy explanation in standard theories of asset pricing.

Consider a young person who anticipates uncertain future wage and equity income. An important fact in this regard is that risky human capital is the major form of wealth for most young people. Another important fact is that equity returns are positively correlated with aggregate consumption and wages, but not highly so.

Given a low correlation between aggregate equity returns and aggregate wages, the high return on equities suggests that they are very attractive investments for the average young worker. That is, equities appear to offer high returns and good diversification benefits for most young workers. On both counts, it seems that the average young worker should have a high demand for equities. But, if this analysis were correct, then millions of young workers would hold large equity portfolios. Collectively, they would drive up the price of equities, lower equity returns and cut the equity premium. This doesn't happen.

Ideally, young workers would like to smooth lifetime consumption by borrowing against future wage income, consuming a part of the loan and investing the rest in equity. In practice, most young people are effectively shut out of equity markets by the high cost of borrowing against future wage income. For most young households, the cost of funds is the interest rate on unsecured credit, which is typically high. A 7.9 per cent return on equities has little lustre for an investor whose cost of funds is 12.9 per cent!

As a result, what initially looks like a high demand for equities by the average young worker becomes a zero or near-zero demand. The proximate reason for this state of affairs is not hard to see. Human capital is risky and highly illiquid. The deeper reasons involve moral hazard, adverse selection, and enforcement problems in lending markets without secure collateral. In any event, the consequence is that most young workers have little or no participation in equity markets.

Who then holds equities, and how are they priced? Here again, the life-cycle perspective is helpful. Equities are mainly held by middle-aged and older persons who have accumulated financial wealth (possibly in a pension fund) over the life cycle.

Their wage uncertainty has largely been resolved. After retirement, future “wages” are either zero or a fixed benefit amount. At this stage of the life cycle, equity income is highly correlated with consumption, and it no longer helps to diversify the effects of risky human capital. Hence, for middle-aged and older persons to hold equity, it must offer a higher rate of return. That is, in equilibrium it must command a large premium over safe securities.

We conclude that there is something of a “free lunch” for young people with substantial financial asset holdings. For a young person in this happy circumstance, equity remains a desirable asset for reasons explained above. Moreover, since equity is priced by older persons, our happy young investor can reap high equity returns but with less impact on consumption risk.

Further reading

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