

Campbell, John Y.

Article

Strategic asset allocation: Portfolio choice for long-term investors

NBER Reporter Online

Provided in Cooperation with:

National Bureau of Economic Research (NBER), Cambridge, Mass.

Suggested Citation: Campbell, John Y. (2000) : Strategic asset allocation: Portfolio choice for long-term investors, NBER Reporter Online, National Bureau of Economic Research (NBER), Cambridge, MA, Iss. Fall 2000, pp. 8-12

This Version is available at:

<https://hdl.handle.net/10419/67039>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

Research Summaries

Strategic Asset Allocation: Portfolio Choice for Long-Term Investors

John Y. Campbell*

Academic finance has had a remarkable impact on many financial services. Yet, financial planners offering portfolio advice to long-term investors have received curiously little guidance from academic financial economists.

Mean-variance analysis, developed almost 50 years ago by Harry Markowitz,¹ has provided a basic paradigm for portfolio choice. This approach usefully emphasizes the ability of diversification to reduce risk, but it ignores several critically important factors. Most notably, the analysis is static; it assumes that investors care only about risks to wealth one period ahead. However, many investors — both individuals and institutions, including charitable foundations or universities — seek to finance a stream of consumption over a long lifetime. In addition, mean-variance analysis treats financial wealth in isolation from income. Long-term investors typically receive a stream of income and use it, along with financial wealth, to support their consumption.

Robert Merton showed 30 years ago that the solution to a long-term portfolio choice problem can be very different from the solution to a short-term problem.² In particular, if investment opportunities vary over time, then long-term investors care about shocks to investment opportu-

nities — the productivity of wealth — as well as shocks to wealth itself. They may seek to hedge their exposures to wealth productivity shocks, and this gives rise to intertemporal hedging demands for financial assets. Michael Brennan, Eduardo Schwartz, and Ronald Lagnado³ have coined the phrase “strategic asset allocation” to describe this farsighted response to time-varying investment opportunities.

Unfortunately, Merton’s intertemporal model is hard to solve. Until recently, solutions to the model were available only in those trivial cases in which it reduces to the static model. Therefore, the Merton model has not become a usable empirical paradigm, has not displaced the Markowitz model, and has had minimal influence on financial planners and their clients. This situation has begun to change recently as a result of advances in both analytical and numerical methods. A new empirical paradigm is emerging. Interestingly, this paradigm both supports and qualifies traditional rules of thumb used by financial planners. It also sheds new light on important issues of public policy such as the design of the Social Security system.

Who Should Buy Long-Term Bonds?

An important difficulty with mean-variance analysis becomes clear when one considers the classic problem of allocating a portfolio among three broad asset classes: stocks, bonds, and money market funds (“cash”). One of the most famous

results in mean-variance analysis is James Tobin’s mutual fund theorem of portfolio choice, according to which all investors should combine cash with a single portfolio or “mutual fund” of risky assets.⁴

The mutual fund theorem directs all investors, conservative or aggressive, to hold the *same* portfolio of stocks and bonds, mixing the portfolio with more or less cash depending on the investor’s aversion to risk. Thus, if an aggressive investor holds 80 percent stocks and 20 percent bonds, a conservative investor should maintain the same 4:1 ratio of stocks to bonds at a lower scale, perhaps 40 percent equities and 10 percent bonds, with 50 percent of the portfolio in cash. This is quite different from the way conservative investors actually behave and are advised to behave by financial planners. In practice, conservative investors favor bonds relative to equities so that a conservative portfolio might consist of 40 percent equities, 40 percent bonds, and 20 percent cash. Investors and financial planners do not seem to take mean-variance analysis seriously.

Furthermore, it is hard to explain — using mean-variance analysis — why any investors hold large positions in bonds. Mean-variance analysis treats cash as the riskless asset, and treats bonds merely as another risky asset like stocks. Bonds are valued only for their potential contribution to the short-run excess return, relative to risk, of a diversified risky portfolio. This view tends to relegate bonds to a minor supporting role in the recommended portfolio, since

*John Y. Campbell is a Research Associate in the NBER’s Program on Asset Pricing and a professor of economics at Harvard University.

excess bond returns historically have been fairly low and bond returns have been highly variable in the short run. From 1970–96, for example, the average excess return on long-term U.S. Treasury bonds over three-month Treasury bills was less than 2 percent, while the standard deviation of this return was almost 11 percent. The ratio of average excess return to standard deviation (the short-term reward-risk ratio or “Sharpe ratio”) for bonds was only 0.18. Over the same period, the U.S. equity market had an average excess return of almost 6 percent and a standard deviation of 17 percent, implying a Sharpe ratio that was almost twice as high at 0.34. The comparison looks even less favorable for bonds if one studies the early postwar period of slowly rising inflation or the very recent period of spectacular stock returns.

A long-horizon analysis treats bonds very differently and assigns them a much more important role in the optimal portfolio. For long-term investors, money market investments are *not* riskless because they must be rolled over at uncertain future interest rates. Just as borrowers have come to appreciate that short-term debt carries a risk of having to refinance at high rates during a financial crisis, so long-term investors must appreciate that short-term investments carry the risk of having to reinvest at low real rates in the future. For long-term investors, an inflation-indexed long-term bond is actually less risky than cash. Such a bond does not have a stable market value in the short term, but it delivers a predictable stream of real income and thus supports a stable standard of living in the long term.

Luis M. Viceira and I⁵ recently completed an empirical analysis of optimal portfolio choice for long-term investors. Using a statistical model of nominal interest rates, real

interest rates, inflation, and stock prices, we calculated optimal portfolios for long-lived investors with varying attitudes toward risk. We concluded that aggressive investors should hold portfolios with almost 100 percent equity, but that more conservative investors should shift largely into bonds, putting a modest allocation into cash. (A larger cash position can be justified as a contingency reserve to meet unexpected consumption needs, but we do not attempt to model this sort of cash demand.)

The conventional wisdom of financial planners holds up well under this analysis: buyers of long-term bonds should be conservative long-term investors, or such institutions as pension funds acting on their behalf. There is one important qualification, however. Our analysis looks at data from 1983–96, during which time monetary policy successfully contained inflation. If we consider historical data from the entire postwar period of 1952–96, then we estimate a much larger risk of inflation, which could erode the real value of long-term nominal bonds. When there is a significant risk of inflation, nominal bonds are far less appealing because they are not good substitutes for inflation-indexed bonds and are not in any sense riskless for long-term investors. Conservative long-term investors who are concerned about the possible return of inflation should hold U.S. Treasury inflation-indexed bonds instead.

Is the Stock Market Safer for Long-Term Investors?

Traditionally, equities have been regarded as risky assets. They may be attractive because of their high average returns, but these returns represent compensation for risk; thus equities should be treated with caution by all but the most aggressive

investors. However, in recent years it has become commonplace to argue that equities are actually relatively safe assets for certain investors to hold for the long term. An extreme version of this revisionist view is promoted by James Glassman and Kevin Hassett,⁶ who argue that stocks are actually just as safe as bonds or Treasury bills, and that investors will bid stock prices up to unprecedented levels as they come to realize this.

The revisionist view that stocks are safe assets is not based on any reduction in their short-term volatility. The volatility of market index returns has moved up and down — most recently up, after an unusually quiet period in the mid-1990s — but it shows no downward trend. Rather, the revisionist view is based on evidence that stock returns are less volatile, relative to bond or bill returns, when they are measured over long holding periods.

This sort of evidence has been presented by Jeremy Siegel,⁷ who uses it to promote an aggressive strategy of buying and holding equities. Looking at U.S. data over a period of almost 200 years (1802–1997), Siegel compares the range of variation of real returns on stocks, long-term bonds, and Treasury bills. In their best single year, stocks delivered a real return of 67 percent, while in their worst single year they returned negative 39 percent, for a range of 106 percent. The one-year range for bonds is far smaller at 57 percent, and the one-year range for Treasury bills is still smaller at 40 percent. A similar pattern emerges if one compares standard deviations of annual real returns as measures of risk. In the 1802–1997 data, the standard deviation of the annual return is 18 percent for stocks, 9 percent for bonds, and 6 percent for bills. For an investor with a one-year holding period, stocks appear to be considerably riskier than fixed-income investments.

The picture is very different for long holding periods of a decade or more. The average annualized real stock return over the best decade between 1802 and 1997 was 17 percent, while the average return over the worst decade was negative 4 percent, for a range of 21 percent. The ranges for bonds and bills over a decade are 18 percent and 17 percent, respectively. Over 20-year periods, the ranges for all three assets are almost identical at 12 percent, and over 30-year periods the range is actually smaller for stocks at 8 percent than it is for bonds and bills at 9 percent. Standard deviations of real returns follow the same pattern when measured over long holding periods; over 20-year periods they are roughly equal, and over 30-year periods they are lower for stocks than for bonds or bills. It would appear that stocks are no riskier than bonds and bills for long-term investors who can hold their positions for at least a decade. Similar patterns are visible in some international markets, although reliable long-term data are harder to come by overseas.⁸

These findings create a puzzle. How can short-term stock market risk largely disappear at long horizons? Where does the risk go? The revisionists devote little attention to this question, but it turns out that the answer is important and it undermines the revisionist case for aggressive investment in equities.

Mathematically, there can be a difference between the short-term risk and the long-term risk of an asset only if its expected return varies over time. With constant expected returns, the annualized standard deviation over a long holding period (N years) is the standard deviation over one year divided by the square root of N . Thus, with constant expected returns, the annualized standard deviations of all assets would shrink along with the square root of the holding period, but they would shrink together; we

would not see the standard deviation of stock returns shrinking more rapidly than the standard deviations of bond and bill returns. Evidence for reduced relative risk of stocks at long horizons is therefore indirect evidence for predictable variation in stock returns.

The type of return variation that reduces long-term risk is known as mean-reversion. If unusually good stock returns today lower the expectation of returns in the future, then bull markets tend to be followed by corrections and bear markets tend to be followed by recoveries; stock prices revert toward a long-run average or mean, and stocks are said to be mean-reverting. Under these circumstances, stock market risk declines more rapidly with the investment horizon than the square-root rule would imply.

Siegel's risk measurements provide indirect evidence for mean-reversion, but more direct evidence is also available. One approach is to look at a smoothed P/E ratio for the S&P 500 Index. The smoothed P/E ratio divides current price by an average of earnings over the past decade, in order to eliminate the effects of temporary earnings declines that occur in recessions. There is a very strong negative relationship between smoothed P/E and subsequent long-term growth in real stock prices; years with high initial P/E ratios — such as 1929 or 1966 — tend to have poor average returns over the next decade, while years with low initial P/E ratios, such as 1918 or 1982, tend to have high average returns over the next decade.⁹

In joint work with Viceira, I have calculated the stock holdings that are optimal for investors with constant risk aversion when stocks are mean-reverting. It turns out that for conservative long-term investors, the optimal policy involves a higher allocation to stocks on average, as recommended by Siegel, but the

allocation depends on past returns. At a time like the present, when past returns have been high and mean-reversion implies low future returns, the allocation may be no higher — it may even be lower — than would be implied by a traditional short-term analysis assuming a constant equity premium.¹⁰

Many investors today are attracted to the stock market by the prospect of high returns combined with low long-term risk. These investors are trying to have their cake and eat it too. If expected stock returns are constant over time, then one can hope to earn high stock returns in the future similar to the high returns of the past. But in such a case, stocks are much riskier than bonds in the long term, just as they are in the short term. If stocks mean-revert instead, then they are relatively safe assets for long-term investors; but in that case, future returns are likely to be meager, because mean-reversion unwinds the spectacular stock market run-up of the past decade.

Investing for Retirement

Even if the stock market does not mean-revert, it may be appropriate for young investors to hold riskier portfolios than older investors because the young typically rely more on income and less on financial wealth to support their consumption. Consider an investor who knows her income in advance with perfect certainty and can borrow and lend freely at the riskless interest rate. For this investor, the present value of labor income, discounted at the riskless rate, is equivalent to a position in a riskless asset. Her financial portfolio thus should be tilted toward risky assets to offset this position.¹¹ Risk in labor income will reduce the magnitude of this tilt toward risky assets, but not reverse it if there is no correlation between labor income risk and investment risk.¹² Only

investors who have volatile labor income that is highly correlated with stock returns, such as investment bankers and executives who are compensated largely through executive stock options, should tilt their portfolios toward safe assets.

A typical investor starts her working life with a small income and very little financial wealth. In early adulthood, income tends to grow fairly rapidly, but people accumulate little wealth since they anticipate higher income in the future and use their current income to support current consumption. In early middle age, asset holdings begin to increase rapidly as investors save for retirement, while current labor income flattens out, and the approach of retirement reduces the discounted value of future labor income. Thus, the discounted value of future income, relative to financial wealth, follows a hump shape over the life cycle. It rises at the very start of a person's career, then peaks fairly early, and declines as retirement approaches. This pattern implies that fairly young investors should have the strongest desire to take stock market risk.

Joao F. Cocco, Francisco J. Gomes, Pascal J. Maenhout, and I¹³ have explored the magnitude of these effects in a life-cycle model calibrated to U.S. data on individual income and aggregate asset returns. We model income as having a deterministic component with a hump shape over working life, and a random component with both permanent and temporary shocks. Permanent shocks to income can be correlated with stock returns. We use household data from the Panel Study of Income Dynamics to estimate the income process for households with different levels of education (college, high school, or no high school diploma) and different employment status (regular employment or self-employment, sector of employment). We

find that households with higher education levels experience smaller temporary income shocks but larger permanent shocks: career risk as opposed to layoff risk. Most household income shocks are correlated only weakly with stock returns, even if we allow for a lag in the effect of the stock market on income. Thus, we estimate that young households should hold more stocks than older households.

In practice, households choose their portfolios subject to various types of constraints. It is extremely difficult for most households to borrow against their future labor income, and it is also difficult for most households to borrow to finance a leveraged position in the stock market. George M. Constantinides, John B. Donaldson, and Rajnish Mehra¹⁴ recently have argued that this fact helps to explain the large historical returns to stocks: young adults are the natural holders of stocks, but they are constrained from taking as much equity risk as they would like. This forces middle-aged investors to take up the slack, which they do only at depressed stock prices that imply high average stock returns.

If financial constraints indeed restrict the investment policies of many households, then government policy may be able to help or hurt households by affecting the severity of the constraints. Cocco, Gomes, Maenhout, and I use our model to evaluate proposals to reform Social Security by investing Social Security funds in the stock market. Such proposals increase the equity exposure of constrained young households and may also allow for a reduction in payroll tax rates, thus increasing the consumption of constrained young households. If we assume that households save optimally given the constraints they face, then reform will benefit households through both channels. If we assume instead that households do not save adequately

on their own, then increased equity exposure will still be beneficial, but it would be a mistake to reduce payroll taxes.

Challenges for Future Research

I have described several factors that may lead long-term investors to choose different portfolio strategies from short-term investors, including changing real interest rates, mean-reversion in stock returns, and labor income.¹⁵ Other factors also can be important, notably taxation and uncertainty about the processes driving interest rates, stock returns, and income. These factors have not yet been integrated in a single empirically usable model, but the construction of such a model is now a realistic ambition. This offers the exciting prospect that financial economists will be able at last to offer relevant and scientifically grounded investment advice.

¹ H. Markowitz, "Portfolio Selection," *Journal of Finance*, 7 (1952), pp. 77-91.

² R. Merton, "Lifetime Portfolio Selection under Uncertainty: The Continuous Time Case," *Review of Economics and Statistics*, 51 (1969), pp. 247-57; "Optimum Consumption and Portfolio Rules in a Continuous-Time Model," *Journal of Economic Theory*, 3 (1971), pp. 373-413; "An Intertemporal Capital Asset Pricing Model," *Econometrica*, 41 (1973), pp. 86-87.

³ M. Brennan, E. Schwartz, and R. Lagnado, "Strategic Asset Allocation," *Journal of Economic Dynamics and Control*, 21 (1997), pp. 1377-1403.

⁴ J. Tobin, "Liquidity Preference as Behavior Towards Risk," *Review of Economic Studies*, 25 (1958), pp. 68-85.

⁵ J. Y. Campbell and L. M. Viceira, "Who Should Buy Long-Term Bonds?," *NBER Working Paper No. 6801, November 1998, forthcoming in American Economic Review*.

⁶ J. Glassman and K. Hassett, *Dow 36,000*, New York: Times Books, 1999.

⁷ J. Siegel, *Stocks for the Long Run*, 2nd ed., New York: McGraw-Hill, 1998.

⁸ Comparative international evidence on stock and bond market performance is reported in J. Y. Campbell, "Asset Prices, Consumption, and the Business Cycle," Ch. 19 in *Handbook of Macroeconomics Vol. 1*, J. Taylor and M. Woodford, eds., Amsterdam: North-Holland, 1999.

⁹ J. Y. Campbell and R. Shiller, "Valuation Ratios and the Long-Run Stock Market Outlook," *Journal of Portfolio Management* (Winter 1998), pp. 11–26. Earlier work on mean-reversion includes E. Fama and K. French, "Permanent and Temporary Components of Stock Prices," *Journal of Political Economy*, 96 (1988), pp. 246–73 and "Dividend Yields and Expected Stock Returns," *Journal of Financial Economics*, 22 (1988), pp. 3–27; J. Campbell and R. Shiller, "Stock Prices, Earnings, and Expected Dividends," *Journal of Finance*, 43 (1988), pp. 661–76; J. Poterba and L. Summers, "Mean-Reversion in Stock Returns: Evidence and Implications," *Journal of Financial Economics*, 22 (1988), pp. 27–60.

¹⁰ J. Y. Campbell and L. M. Viceira, "Consumption and Portfolio Decisions When Expected Returns Are Time Varying," *Quarterly Journal of Economics*, (May 1999), pp. 433–95. This paper

assumes that interest rates are constant. Similar results are reported in J. Y. Campbell, Y. L. Chan, and L. M. Viceira, "A Multivariate Model of Strategic Asset Allocation," a forthcoming NBER Working Paper, for a model with time-varying interest rates. An obvious concern about the portfolio rules developed in these papers is that they require all investors to buy or sell stocks simultaneously, which is not possible in general equilibrium. One possible resolution of this problem is that most investors have attitudes toward risk that are not stable but shift over time, as proposed by J. Y. Campbell and J. H. Cochrane, "Habit Formation: A Consumption-Based Explanation of Aggregate Stock Market Behavior," *Journal of Political Economy*, 107 (1999), pp. 205–51.

¹¹ Z. Bodie, R. Merton, and W. Samuelson, "Labor Supply Flexibility and Portfolio Choice in a Life-Cycle Model," *Journal of Economic Dynamics and Control*, 16 (1991), pp. 427–49. These authors emphasize that the tilt toward risky financial investments is strengthened if investors are able to adjust their labor supply, work harder, or delay retirement in response to poor returns on risky assets.

¹² L. M. Viceira, "Optimal Portfolio Choice for Long-Horizon Investors with Nontradable Labor Income," NBER Working Paper No. 7409, October 1999; forthcoming in the *Journal of Finance*.

¹³ J. Y. Campbell, J. F. Cocco, F. J. Gomes, and P. J. Maenhout, "Investing Retirement Wealth: A Life-Cycle Model," NBER Working Paper No. 7029, March 1999; forthcoming in *Risk Aspects of Investment-Based Social Security Reform*, J. Y. Campbell and M. Feldstein, eds., from University of Chicago Press. This paper relies heavily on the specification developed in J. F. Cocco, F. J. Gomes, and P. J. Maenhout, "Consumption and Portfolio Choice over the Life Cycle," unpublished paper, Harvard University, 1998.

¹⁴ G. M. Constantinides, J. B. Donaldson, and R. Mehra, "Junior Can't Borrow: A New Perspective on the Equity Premium Puzzle," NBER Working Paper No. 6617, June 1998.

¹⁵ Luis M. Viceira and I are currently writing a book that reviews these factors in greater detail, *Strategic Asset Allocation: Portfolio Choice for Long-Term Investors*, forthcoming from Oxford University Press.

Capital Flows and Crises in Emerging Markets

Michael P. Dooley*

Private capital flows to developing countries have been characterized by surges of inflows followed by financial crises. Explanations for this volatility can be found in the behavior and expectations of investors. However, the challenge is to look for less obvious explanations. In particular, is there a framework that can

inform us about the apparently very different events, such as the 1982 debt crisis in Latin America and the 1998 crisis in Russia, without appealing to destabilizing investor behavior? Only ten years ago most "academics" were convinced that crises could be explained by conflicts between exchange rate policies and fiscal policies of emerging market governments. This view has been demolished by the apparent absence of such conflicts preceding recent crises in Asia.

My research strategy has been to propose alternative policy conflicts while retaining the assumption that private financial markets are inherently stable. The foundation of this

approach is the well-known moral hazard problem. The idea is that the behavior of private debtors and creditors is influenced by the expectation that, in some circumstances, creditors will be able to sell their claims to a government on terms that are favorable relative to market prices at the time of the sale.

The capital inflow/crisis sequence based on moral hazard can be summarized as follows:¹ the availability of free insurance raises the expected yield on a set of liabilities issued by residents for a predictable time period. The yield differential relative to international returns generates a private gross capital inflow (a sale of domestic liabilities to nonresidents)

* Dooley is a Research Associate in the NBER's Program on International Finance and Macroeconomics and a professor of economics at the University of California, Santa Cruz. His "Profile" appears later in this issue.