

More Social Security, Not Less

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The most striking feature of the ongoing political and academic debate about the Social Security system in the U.S. is a lack of innovative thinking. The economic models and forecasts of the long-term viability of Social Security are treated in some ways as a zero-sum game—either assets are effectively shifted from low-yielding U.S. government bonds to investments with higher expected returns and more risk, or liabilities are reduced by changing benefits, in effect, deviating from the original intention of providing a basic economic governmental safety net for retirees. This grim calculus has been presented to us repeatedly over the past few years. Something has to give because the system cannot be sustained in the long run. Sacrifices—particularly by the generation of 40-somethings who have contributed via a professional lifetime of payroll taxes, but who will not receive their expected benefits—will be necessary to save the U.S. government from future bankruptcy.

In the face of this rhetoric, one might easily argue that the real problem with Social Security is that it is far too limited in the future benefits it offers savers, rather than being too expansive. Social Security actually provides a unique kind of protection to retirees by effectively guaranteeing a standard of living at retirement—not simply growth in benefits in inflation-adjusted terms. Social Security benefits increase with the average wage level,

which is, in turn, tied to growth in the overall U.S. economy. This innovation was intended to ensure that retirees are not left behind while the rest of the economy enjoys the benefits of sustained national economic expansion.

One may argue about whether this is fair or necessary, but that is not the purpose of this article. If one accepts that wage indexation of benefits is broadly desirable, then assets should be managed in such a way as to maximize the ability to achieve this goal—whether in the context of a government agency, in the context of individual investor accounts, or through another form of financial intermediation. There is another important implication of wage indexation, however. To the extent that wage indexation provides a retirement annuity benchmarked to the national standard of living, people may be willing to pay for more of it. Suppose, for example, that instead of facing the prospect of losing your currently promised wage-indexed future benefits you could increase them throughout your lifetime by buying more government insurance. Many people may find this an attractive possibility.

This article argues that the Social Security Trust Fund could be turned into a viable endowment that would do two things. First, it would manage its assets to cover all currently promised obligations by shifting its portfolio to investments with long-term growth potential. Second, it would issue more wage-indexed insurance contracts at market rates. This would

not only generate profits to help cover the costs of basic Social Security liabilities, but would provide a realistic means for savers to plan for the future and avoid the risk of failed personal savings plans.

The empirical analysis in the article focuses on the stochastic nature of the liabilities faced by such an endowment and examines, in particular, the optimal portfolio of assets required to hedge wage-indexed liabilities. The results of the analysis suggest that the optimal investment portfolio for meeting long-term wage-indexed liabilities contains assets that move with inflation, particularly real estate.

Even if a government pension agency were not established, these findings suggest a number of things. First, the current investment policy of funding vested liabilities with long-term bonds is not optimal. Second, if private accounts were offered as an alternative to the current system, savers should be given the option of investing in assets, such as real estate and commodity funds, that track the growth of inflation and wages. Third, it would be difficult for a private insurance company to hedge wage-indexed liabilities in the same manner as the government. Our current income tax structure provides a natural means to meet these liabilities in the event of the failure of the financial markets.

HEDGING THE WAGE INDEX

In this section, we examine the feasibility of hedging the wage index using currently available investment assets. The approach relies upon the basic tools of modern portfolio theory. We use estimates of the return, risk, and correlations of a number of asset classes to form two potential investable portfolios. The first is chosen to minimize the tracking error between fund return and the percentage change in the wage-index liability probability. The second is chosen to maximize the probability of exceeding the wage index by taking higher risk in anticipation of higher return.

Asset Choice

Our choice of assets is based upon the availability of an investable index and the likelihood of this asset class having some correlation to changes in the wage index. Our analysis focuses on stocks, bonds, real estate and commodities. The latter two asset classes are included because of their well-known correlation to inflation. We consider

two stock market indices—the S&P 500 Index and the NAREIT Equity Index, which is an index of real estate investment trusts. Our bond indices include measures of the total return to long-term government bonds (the current asset holdings of the Social Security Trust Fund) and returns to a rolling investment in 30-day Treasury bills. Commodity returns are captured by the S&P Commodity Index, and nonpublic real estate returns are captured by the NCREIF Property Index (NPI) of commercial real estate returns. This is a broad-based index of unlevered, institutionally held properties for which the total return calculation is based upon actual cash flows and professional appraisals. The conservative nature of the appraisal process smoothes returns, and thus has the effect of reducing the measured volatility of the NPI.

Exhibit 1 reports the summary statistics for these asset classes, as well as some macroeconomic variables of interest—U.S. GDP growth and U.S. inflation over the period for which data on the growth in the wage index is available (1952–2003). Some series began later than 1952, so the statistical measures are not strictly comparable. These measures are, however, included in Exhibit 1. The series are ranked according to their relative annualized growth rates. Notice that the growth in the wage index is higher than the growth in CPI and just less than the return to an investment in U.S. T-bills over the same period. The returns to stocks, bonds, commodities, and real estate exceeded the growth in the wage index.

Exhibit 2 reports the correlations between all of the series. Notice that wage growth is positively correlated to GDP growth, inflation, T-bill returns, and real estate returns, as measured by the NPI, but negatively correlated to stocks, long-term government bonds, and real estate, as measured by the NAREIT Index. Wage growth has modest, but positive correlation to growth in commodity prices. These correlations are largely driven by the period of strong growth in real asset values and inflation during the 1970s and 1980s.

Exhibit 3 shows the regression of wage growth on T-bill returns. The observations are numbered by year and boxes at each observation indicate relative proximity in time. Although 1972 was somewhat of an outlier—a year when T-bill returns lagged far behind wage growth—there is a consistent positive correlation between the variables throughout the period. If anything, these results suggest that the Social Security Trust Fund should be holding short-term instruments rather than long-term government bonds.* Bond values are likely to drop in periods

EXHIBIT 1

Summary Statistics of the Series

Asset Class	Years of Data	Geometric Mean	Arithmetic Mean	Standard Deviation
NAREIT-Equity TR	32	12.9	14.2	17
S&P 500 TR	52	11.5	12.9	17.6
NCREIF Property TR	26	9.3	9.5	6.2
S&P Commodity TR	33	7.1	9.5	25.1
IMF U.S. GDP	52	7.0	7.0	2.8
U.S. L-T Gvt TR	52	6.3	6.8	10.8
U.S. 30-Day T-Bill TR	52	5.1	5.2	2.9
Wage Index Growth	52	4.9	4.9	2.2
U.S. Inflation	52	3.8	3.8	3.1

Note: All data are based on annual percentage changes and are taken from Morningstar Ibbotson Associates EnCorr program, except the wage growth variable, which is a U.S. government statistic. All mean and standard deviation values are in annual percentage terms.

EXHIBIT 2

Correlations of Series

Series	Wage Gr.	GDP	S&P 500	LTG	TBill	INFL	NAREIT	NCREIF	Commodity
Wage Gr.	1.0	0.72	-0.13	-0.17	0.58	0.63	-0.01	0.63	0.12
U.S. GDP	0.72	1.0	-0.17	-0.22	0.37	0.61	0.05	0.55	0.25
S&P 500	-0.13	-0.17	1.0	0.12	-0.02	-0.02	0.46	0.12	-0.25
LT Gvt	-0.17	-0.22	0.12	1.0	0.23	-0.14	0.21	-0.23	-0.24
30 Day T-Bill	0.58	0.37	-0.02	0.23	1.0	0.4	-0.07	0.52	-0.07
U.S. Inflation	0.63	0.61	-0.02	-0.14	0.4	1.0	-0.13	0.51	0.3
NAREIT	-0.01	0.05	0.46	0.21	-0.07	-0.13	1.0	0.04	-0.07
NCREIF	0.63	0.55	0.12	-0.23	0.52	0.51	0.04	1.0	0.15
Commodity	0.12	0.25	-0.25	-0.24	-0.07	0.3	-0.07	0.15	1.0

Note: This correlation matrix is constructed using annual percentage changes in each of the variables. The correlation is measured over the maximum period of pairwise overlap in each series. All data are from Morningstar Ibbotson Associates EnCorr program, except wage growth, which is a U.S. Government statistic.

when wages increase, causing the difference between the value of fund assets and fund liabilities to widen.

Constructing a Hedge

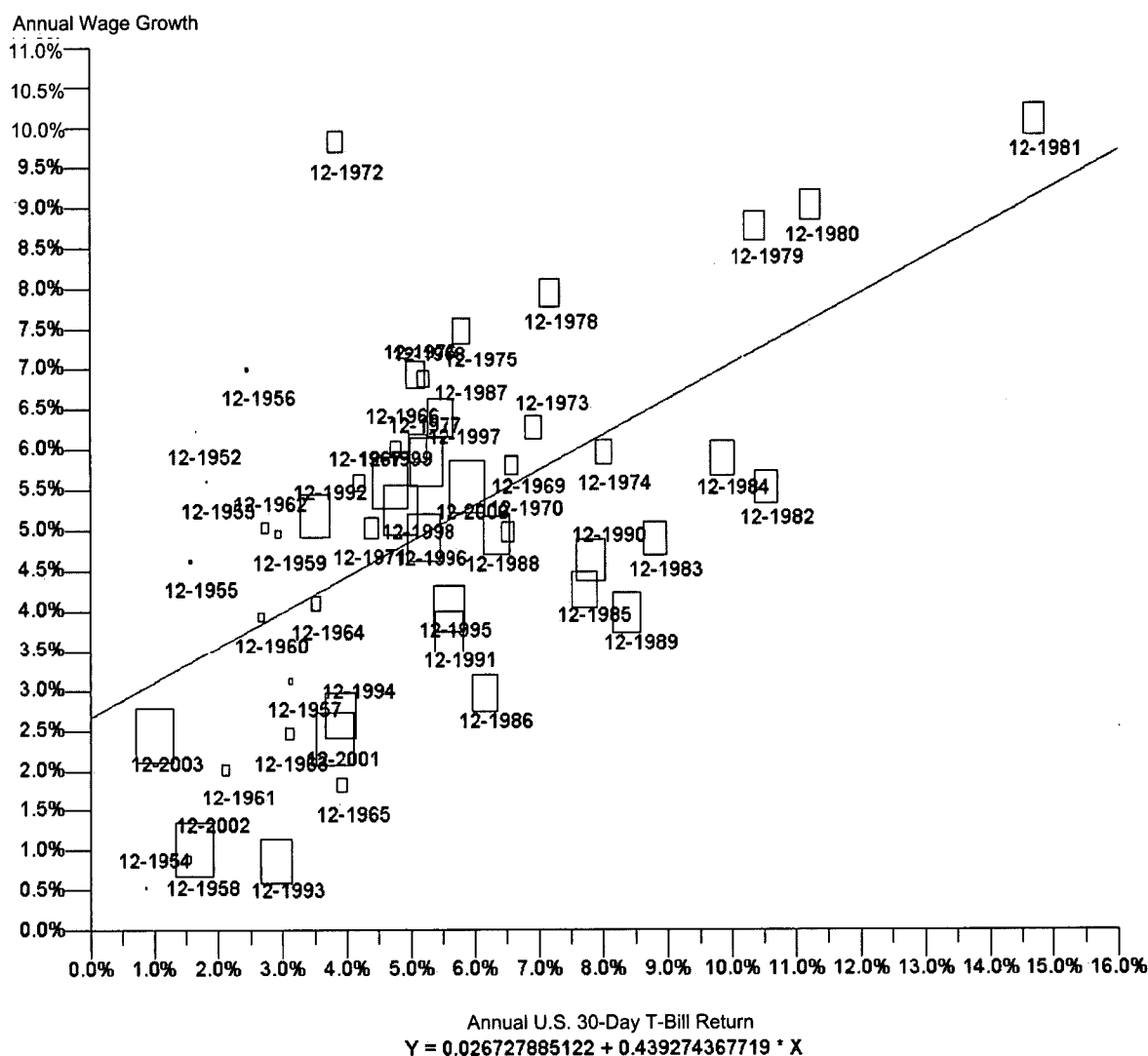
In order to construct a portfolio that hedges wage growth, we begin by assuming that assets are equal in present value to liabilities; that is, our investment portfolio is neither overfunded nor underfunded. Our goal in this stage of analysis is to find the mixture of asset holdings that on a dollar-for-dollar basis provides the lowest tracking error.

We define the wage variable as the liability and construct an efficient frontier in terms of surplus returns in excess of the liability. In effect, we require the portfolio to hold one dollar of liabilities—characterized by the mean, variance, and covariance of the wage index—and we construct a set of undominated investment portfolios from the remaining set of assets. The minimum-variance portfolio is that portfolio which minimizes the tracking error with respect to changes in the wage index.

Because the volatility of the NPI is almost certainly underestimated, we increase its annual standard deviation

EXHIBIT 3

Regression of Annual Wage Growth on Annual Return to U.S. 30-Day Treasury Bills,
December 1952–December 2003



Note: The estimated model estimates are reported below the x-axis. The coefficient estimate is statistically significant at greater than the 1% level. Observations are indicated by boxes. Larger boxes are more proximate in time. Date labels indicate the month and year of the observation.

to 12%. Also, because the expected returns to property investment through REITs are unlikely to be higher than the return to S&P 500 stocks, we reduce the expected return of the NAREIT Index to 10% per year. Finally, we use the average long-term rate of return on bonds instead of the current bond yield. This is conservative to the extent that it may overestimate the attractiveness of bonds as investments. For all other asset classes we retain their historical statistical values.

Exhibit 4 shows the efficient frontier. Note that because we prohibit short sales for the purposes of this

analysis, the frontier has a slightly flattened shape. T-bills are near the minimum-variance point, but they are not precisely on it. A portfolio of 90% T-bills, 4% S&P 500 stocks, 2% long-term government bonds, 3% commodities, and 1% equity REITs is actually the optimal hedge portfolio from the perspective of minimizing tracking error with respect to wage index growth; that is, this allocation minimizes the variance of the expected difference between fund liabilities and assets.

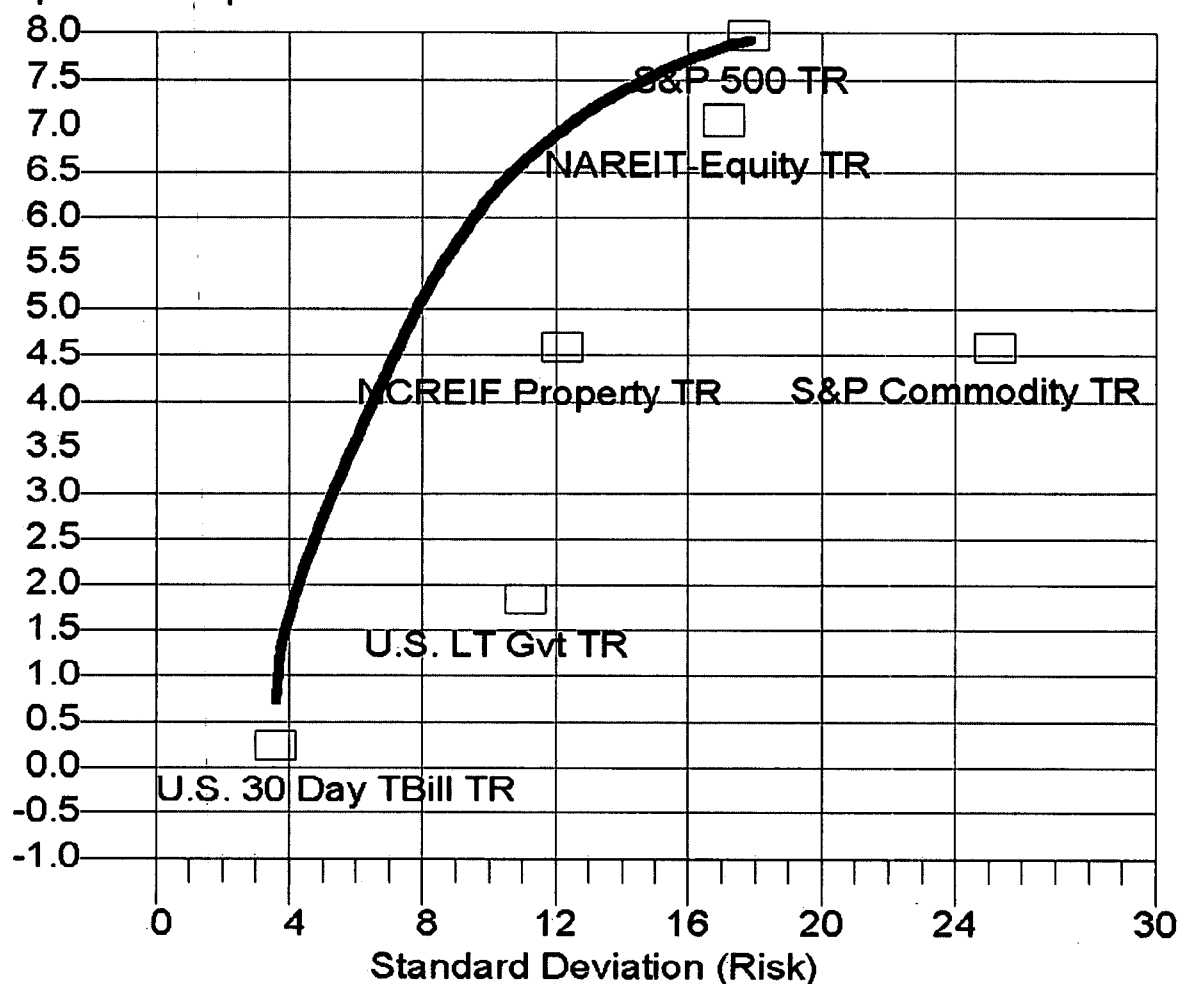
In this framework, the allocation provides an expected surplus of 0.8%, or 80 basis points per year, with an annual

EXHIBIT 4

Efficient Frontier

The frontier is constructed using the Morningstar Ibbotson Associates EnCorr Optimizer. Inputs are taken from historical values except for the two real estate series. NCREIF Index volatility is set to 12%, and NAREIT Equity Index return is set to 10%. Weights are constructed using non-negativity constraints. The optimization is performed using the assumption of a liability stream matching the U.S. wage growth variable. The present values of assets and liabilities are set as being equal to each other in order to match the assumption that liabilities are fully funded.

Expected Surplus



standard deviation of 3.5%. This point is not necessarily the optimal choice. It does not, for example, maximize the probability of achieving a positive surplus. That point on the frontier can be found by finding the portfolio with the highest ratio of expected surplus to standard deviation. It is represented by holdings of 23% S&P 500 stocks, 19% long-term government bonds, 30% NPI, 13% commodities, and 14% REITs. It has an expected surplus of 5.2% per year and an annual standard deviation of 7.9%. Under the assumption that returns are normally distributed, this results in an annual probability of the surplus

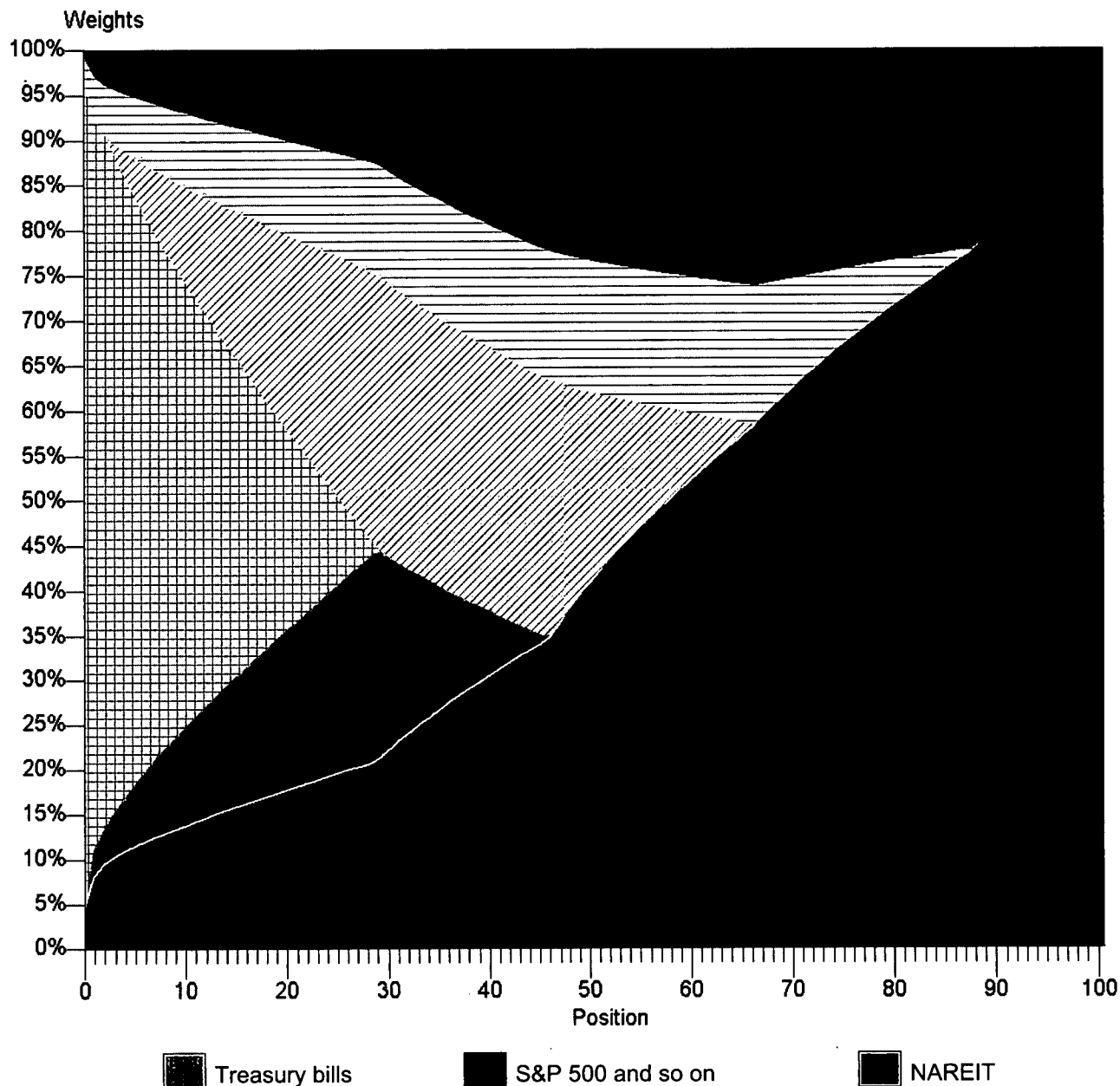
portfolio achieving a positive return of 74%. Thus, at least under the basic assumptions of this analysis, we find that a fairly well-diversified portfolio of assets, including stocks, bonds, real estate, and commodities provides the best potential for portfolio return to exceed growth in the wage index. Exhibit 5 shows how portfolio weights vary across the entire range of the efficient frontier.

Why not simply invest in the highest-returning asset, given the long-term nature of the liabilities? After all, shouldn't stocks provide the best chance of long-term growth? The reason an all-stock portfolio is not optimal

EXHIBIT 5

Portfolio Weights

This exhibit represents the change in the composition of portfolios along the efficient frontier. The X-axis scale corresponds to increasing risk along the frontier divided into 100 equal increments.



as a hedge against liabilities is explained by the negative correlation between stocks and wage growth. Historically, stock returns have been low when wage growth has been high. On average, however, stock returns have been high. Nevertheless, the chance exists that such a scenario will repeat itself in the future and equity returns will fail to

keep pace with wages. If so, this may occur just when equity assets are most needed to meet obligations, but may, as a result, actually be worth less.

Our analysis, which uses the tools of modern portfolio theory, demonstrates a few basic points. First, long-term government bonds are not the ideal hedge against

growth in the wage index. Second, while a portfolio composed primarily of Treasury bills is the best proxy for the wage index variable because it is the most highly correlated to it, it is not an ideal choice if the investment goal is to maximize the probability that assets will exceed liabilities in the long run. Third, investment options such as real estate and commodities, may be important components of an optimal hedging portfolio designed to maximize the probability of exceeding wage growth. Yet these alternative asset classes have not been seriously discussed as options for individual investor accounts. Should we be asking investors to try and exceed liability growth without giving them the full toolkit to do so?

Known Limitations

Modern portfolio theory has some important limitations that temper the interpretation of our analysis. Most important is the problem that the risk of many of the variables may be improperly estimated. A standard assumption is that the returns of each asset class are independently distributed through time. They may be correlated to each other contemporaneously, but they are assumed to follow a random walk with respect to past returns. If this assumption is violated, then the standard deviation, as measured from historical returns is a poor representation of the risks over a multiyear horizon. The intuition is that when a highly autocorrelated variable begins to decrease in value, it has a downward momentum that causes it to have lower values, on average, for a period of time, and vice versa. So, for example, if wages began an upward trajectory, that trend might continue for a while. This tendency will result in wider distributions of outcomes at multiyear investment horizons.

One troublesome implication of this problem is that wage growth, which is highly autocorrelated, may in fact be riskier than historical statistics would suggest. In other words, the current risk of future Social Security payouts compared to Social Security Trust Fund assets is higher than current economic projections, if they have been made in the absence of a time-series model. One approach to this limitation is to construct an econometric model that includes intertemporal dependency. This would allow a simulation of a variety of intertemporal investment strategies; however, it would no longer provide an "optimal" strategy in the sense we use the term here. Such a simulation should be used in any serious analysis of Social Security portfolio choice as a way to check the

recommendations provided by modern portfolio theory models. If, and when, the Social Security liability becomes a national investment problem, economists should provide guidance about the implications of investor choice. Individual account holders will need to know the true risks they face.

OFFERING A WAGE-INDEXED PENSION ANNUITY

The analysis to this point ignores whether the portfolio of assets designed to meet the wage-index liability belongs to the government. It may instead belong to individual savers in private accounts or to a private insurance company seeking the most efficient means to hedge itself against promised future payments. In this section, we argue that a government-owned or government-sponsored corporation might, in fact, be ideal for this purpose.

Given the level of financial innovation in the U.S. over the past few decades, it is perhaps somewhat surprising that a wage-indexed retirement annuity is not currently offered by the private sector. Although the modern insurance market offers an astounding array of annuities for savings, no firm currently offers a contract tied to the wage index. Why not? After all, a primary reason to save for retirement is to provide future income that allows a decent quality of life. If the government were to eliminate wage indexation, it would be an ideal marketing opportunity for the private insurance sector to offer contracts that make up the difference between revised expectations and the amount the government once guaranteed. If the private sector provided these contracts it would certainly be enhancing public welfare. In the parlance of modern finance, they would be "completing" the market. Indeed, even if wage indexation remained unchanged, there would likely be a demand for such contracts.

A Government-Sponsored Pension Agency

In the current financial crisis, the national mortgage agencies have been criticized for taking advantage of an implicit government guarantee, or more properly, on the right to borrow from the government at a preferred rate. The intellectual foundation for this critique is that the special relationship enjoyed by Fannie Mae and Freddie Mae represents, in effect, unfair competition; that is, the private sector is competitively disadvantaged. This critique

assumes that the private sector can offer everything the government agencies can offer.

A natural question to ask in response to this argument is: Would it? That is, would the private sector have created this extraordinary secondary market for mortgages, had it been left the opportunity to do so? Based on the comparative lack of similar securitized markets in most other countries around the world, it is doubtful that such equilibrium would have been achieved without the U.S. government's decision to create these agencies. Despite the current crisis engendered by subprime issuers, the creation of quasi-public agencies to address the latent demand for housing finance over the past decades was an overwhelming success, and has positively affected a large number of households in the U.S. Would this great leap in financial architecture have occurred if we had left housing finance entirely to the local savings and loans, and asset-backed securitization to the investment banks? It is unlikely.

Another recent concern is that the agencies concentrate mortgage risk and raise the potential of a systemic financial failure. Although the current financial crisis is largely due to the failure of the subprime mortgage market, Fannie Mae and Freddie Mae have been caught up in it.

Would a government pension agency share the same problem of concentrating financial risk in one major entity? Is it better to break up the issuance of wage-indexed annuities across a spectrum of private issuers? The failure of the private market to stimulate widespread use of annuities has been termed by academia the "annuity puzzle." Perhaps the puzzle is due to a lack of a large-scale institutional commitment, rather than an irrational propensity on the part of investors. After all, the investment in life annuities was widespread throughout the 18th century in Europe.

The argument in favor of putting current pension liabilities into a federal agency is that it would facilitate the setting of an investment policy geared to meeting these liabilities, instead of an investment policy geared to maximizing shareholder value in a private enterprise. The concentration of these liabilities would make it easier to fix payment problems should they arise, rather than shifting this risk to individuals. A shock to savings assets (or monetary values) that broadly threatens retirement pensions would be systemic, regardless of the financial architecture.

The financial architecture of such a plan is straightforward. Create a company with a separate budget and,

initially, complete government ownership. The company (say, the Government-Sponsored Pension Agency, or GSPA) would assume all the current obligations of the Social Security system, all the current assets of the Social Security Trust Fund (i.e., the U.S. government bonds that it holds), and future payroll contributions. The GSPA would have the immediate goal of using these assets to meet all specified obligations due to current beneficiaries. It would do this by rebalancing its portfolio of assets, perhaps in the manner explored in this article. The current government guarantee of future Social Security payments would flow through to beneficiaries. This plan does not allow the U.S. government to off-load its promises.

The one significant additional benefit that GSPA should be given by the government is the exclusive right to sell additional wage-indexed retirement annuities backed by a government promise to pay. These would be offered at market rates that provide a profit to the agency. This profit may be sufficient to defray part of the costs of Social Security benefits currently offered. This feature might also allow the agency to become a public company, although the dispute over who profits from the government guarantee would be an issue. If the market for "extra Social Security" develops into a profitable enterprise, it might attract private equity capital that would allow for further development. It might also enhance public scrutiny and regulatory oversight if the agency were subject to the legal framework governing public corporations. Such future privatization is not necessary, however, for a government-sponsored pension agency to be successful.

Although private companies could also offer annuity contracts, there is good reason to believe that government annuities would be much more attractive than annuities offered by private firms. One reason for this is that the U.S. government has a life expectancy beyond the life of an individual. Another reason is that one of the gravest concerns of a long-term insurance purchaser is default risk. A U.S. government promise of payment is worth more than the same promise from a corporation because the government is stable and has the power to tax. Although raising taxes to meet pension obligations is not ideal, it could be done in the future should asset growth not match future liability growth. Indeed, in the case of wage-indexed retirement annuities, the possibility of directly taxing future wages exists, offering the potential for a close match between the fluctuations in liabilities and the value of a future tax.

Alternate Structures

If the proposal for a government-sponsored pension agency proved to be politically infeasible, then alternative structures could be used to achieve the two goals proposed in this article: 1) maximizing the probability of meeting wage-indexed retirement payouts, and 2) meeting the demand for more wage-indexed pension annuities. The first goal may be partly addressed by adjusting the asset allocation of the current Social Security Trust Fund and/or offering individual accountholders the option of investing in a portfolio that is engineered to maximize the probability of meeting its liabilities. Neither of these alternatives is included in the plans currently being discussed by the major political parties, but they should be.

The second goal can theoretically be addressed by the private insurance sector; however, a catalyst is needed to set the process in motion. This catalyst might be the offer of a government guarantee in return for government oversight of risk-based capital requirements, or the creation of a government corporation whose equity shares can eventually be purchased by major insurance providers, effectively privatizing the entity rather than establishing a government-sponsored competitor. As long as we focus on the goals of creating an endowment designed to match future liabilities and a marketplace for additional wage-indexed retirement annuities, the final structure can be left to the interplay of politics and the marketplace.

CONCLUSION

As politicians debate what amounts to a default on future pension promises to U.S. citizens—disguised as a restructuring or reconfiguration of the Social Security system—it is important to think more broadly about solutions that would allow the U.S. government to keep its promises. Governments have faced fiscal crises many times in the past. Restructuring has always been an option,

but it has adverse reputational consequences for investors and citizens. The low interest rates enjoyed by the U.S. government today are a direct consequence of its nearly perfect record of paying its bills.

Although one may argue that the reduction of Social Security benefits would not represent a default, such semantics are lost on a large sector of the population who have planned their future economic lives around the expectation of a guaranteed, indexed, minimum level of income, conditional upon their past contributions. Rather than risk a permanent shift in public trust, it is advisable to consider some creative alternatives.

As all U.S. citizens begin to face the prospect of mastering modern portfolio theory in order to manage their individual retirement accounts, it is worth considering that some would prefer to delegate the responsibility of understanding means, variances, correlations, autocorrelations, input uncertainty, efficient frontiers, and probabilities to an agency that can deliver what they are expecting from their investment—a future income that allows them to maintain a reasonable standard of living. Wage-indexed pension annuities might just be an attractive alternative to the complexities of personal portfolio management.

ENDNOTE

*The rate payable on the special issue bonds is reset monthly, so it is actually a floating rate. According to the *2007 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds*, “rates are set equal to the average market yield on all outstanding marketable U.S. securities not due or callable until after 4 years from the date the rate is determined.”

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