Modernizing the Defined-Benefit Pension System

A national concern.

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By all accounts, the defined-benefit (DB) pension system in the United States is experiencing extreme stress. The aggregate pension valuation of the companies in the S&P 500 index dropped from a $239 billion surplus in December 1999 to a $252 billion deficit in May 2003. A similar pattern is evident in pension trusts for public sector employees.

It was easy for organizations to make long-term promises when there was little or no pain in providing them, but many decision-makers and law-makers may not have remembered the idea of "no pain, no gain." The DB system may thus not survive as a viable option for paying retirement benefits.

How did the DB system get into the current crisis? The Employee Retirement and Income Security Act (ERISA), passed in 1974, served the country reasonably well over its first 20 years. Since the early 1990s, however, pension systems have evolved in several directions, and regulations have not kept pace with the changing world.

First, the DB system has grown to a massive size compared to its size in the 1970s and to the sponsoring companies' market capitalization. Second, until 2000, company executives had come to depend on a positive economic environment—few recessions, and with mild consequences relative to the long-run averages. A DB system became a profit center for many companies, as their returns on plan assets (primarily equity) outperformed the growth in liabilities.

Three other issues are pertinent:

1. Current regulators are often slow to identify severe funding difficulties in time to take corrective action.
2. Investment and contribution strategies do not pay adequate attention to protecting a plan's surplus under stressful market circumstances.
3. Current regulations have little to say about a company's ability to pay. The consequences that an underfunded plan will occur in a weak company are poorly evaluated. The Pension Benefit Guaranty Corporation (PBGC) accepts a considerable degree of moral hazard. Take the case of the airline industry. Once several large companies fall into a deficit and are given a benefit by a bankruptcy judge, other companies have an incentive to line up to get the same benefit. The PBGC suffers accordingly. Kandarian [2003] expands this discussion.

We discuss the nature of pension planning from the standpoint of a long-term multiperiod investor. A sponsoring company should coordinate its pension decisions with its core financial plans. Many DB pension trusts have become large compared to a company's market capitalization; the pension obligation can have a significant impact on the company's long-term health.

We suggest that pension risk should be defined with respect to the company's environment and ability to pay. An anticipatory integrated approach is needed over the long run. Current regulations that allow smoothing over several years distort the current strength of a DB plan and hamper regulators from taking action in time to avoid large failures. To help with this task, we have readily available financial engineering tools.

There are disparities in DB systems among industries projected forward over a nine-year planning horizon. We find these disparities will likely persist unless there is some change in investment or contribution strategies, or regulations are modernized. We develop an integrated pension trust and corporate planning system to conduct our anticipatory analysis. "Business as usual" will not likely be a possibility.

CONTRIBUTIONS AND ASSET ALLOCATION FOR PENSION PLANS

Pension plan administrators, and company executives by inference, must address two critical issues regarding the financial health of their defined-benefit pension trust. First, the long-run performance of the assets (plus contributions) should be sufficient to support the legal obligations of the sponsoring corporation with regard to its pension cash flows. This requirement should be clear from ERISA and other long-standing regulations; all parties agree. Second, the plan administrator must adhere to the prudent investor rule and other regulations regarding procedures and risk. The Society of Actuaries provides details of these various standards at its website.

Contributions are made according to a complex set of regulations based on tax, accounting, and actuarial issues. In theory, regulations are set out to balance the conflicting interests of the diverse stakeholders. For instance, under certain underfunded conditions, a plan must make a minimum contribution. Ideally, the amount of the contribution will reduce the long-term risks to an acceptable level. Yet a company cannot make an arbitrarily large contribution; otherwise, there is a concern about unfair tax deferral. From the standpoint of the regulators, the size of the minimum and maximum contributions should represent a reasonable compromise among competing issues (adding risks versus reducing tax revenues).

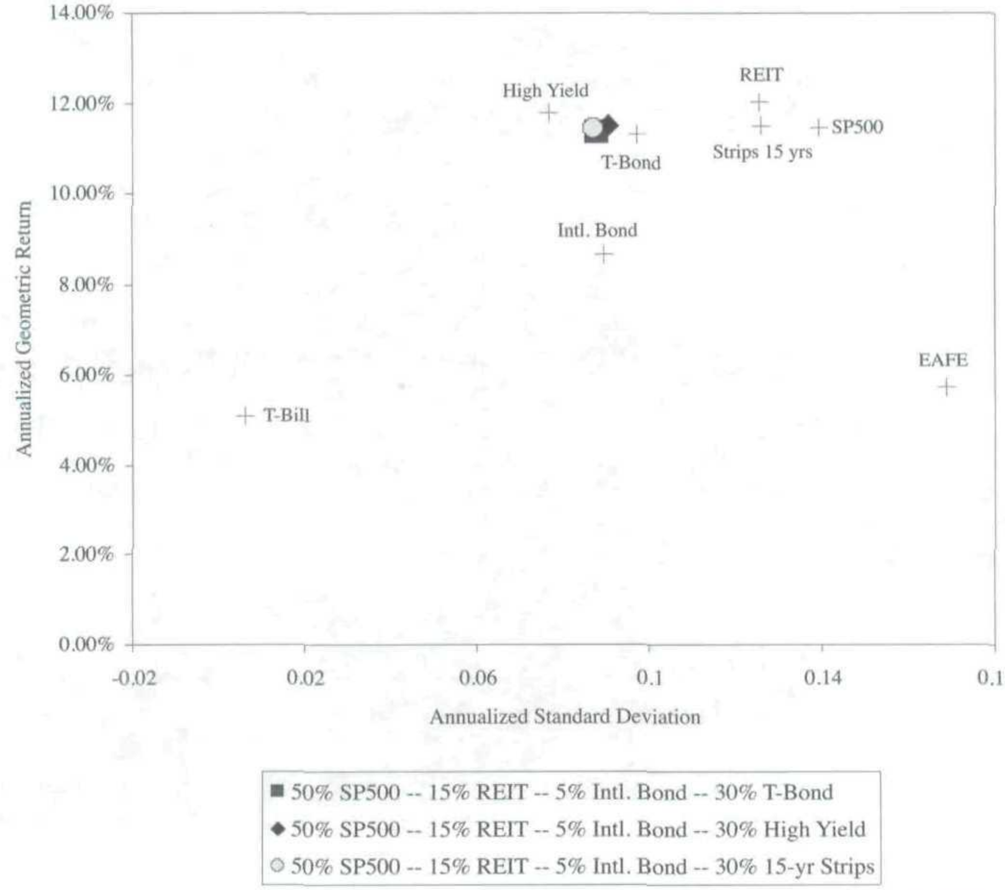
Similarly, plan administrators make compromise decisions about the investment mix. A highly aggressive portfolio may result in higher expected returns and possibly lower future contributions. But of course there is a price to pay if and when the day comes that asset performance is worse than hoped for, poorer than the historical average, and much worse than planned for. This unpleasant fact about financial life has arrived for many DB pension plans.

A highly conservative plan, on the other hand, will more likely support future cash flows, but the costs are also likely to be higher on average. There may be debate about the current equity risk premium, but we are taking a long-run perspective in this discussion.

An overriding issue for pension planning involves long horizons and demographic conditions, especially increasing retiree longevity and population shifts. A contribution in 2005 may have to support a liability in 2050, for example. The long-horizon issue cuts two ways. First, it is difficult to place an exact number on either the current value of the future liabilities or even the cash flow itself. For example, future benefits for active workers will increase as a function of future inflation. Then, the workforce will grow at a rate different from inflation. Thus, the cash flows present a moving target, making it difficult to fully hedge the pension trust for a viable company.

EXHIBIT 1

Risk-Return Profile of Different Asset Classes (monthly returns 9/1/1989–9/1/2004)



Asset allocation can be divided into two complementary questions. First, what is needed to generate acceptable returns for the assets? And, second, what can be done to protect the surplus during periods of market stress? Both issues fall under the heading of asset and liability management (ALM).

There are numerous models available for addressing this problem. Ziemba and Mulvey [1998] and Ziemba [2003] describe examples of successful ALM systems. Fabozzi, Focardi, and Jonas [2004] discuss applications of ALM in European pension trusts. For our purposes, we separate the two questions in order to emphasize the duality of the goals.

While it is obvious that a pension plan has a long-term horizon, many investors apply static portfolio analysis to this problem. Thus, it is difficult to evaluate the condition of a pension plan in an anticipatory fashion. A multiperiod model can provide a more realistic setting for long-term investors than a static model (see Luenberger [1998] and Mulvey, Pauling, and Madey [2003] for examples).

To illustrate the differences, we develop in Exhibit 1 examples of a typical asset allocation over the period 1989–2004. Each asset is shown on a reward/risk chart. We construct three portfolios that rebalance the investments to a target mix each month. The rebalancing strategy, called the *fixed-mix rule*, has important characteristics for long-term investors.

The asset mixes are typical for many pension plan investors, but each portfolio has a different bond category: 1) high-yield bonds, 2) U.S. Treasury bonds, and 3) U.S. government STRIPS. A static analysis yields Sharpe ratios as follows: high-yield = 0.88, T-bonds = 0.64, and STRIPS = 0.51. Significantly, the three rebalanced portfolios attain the same geometric returns and risks over the 15-year horizon we analyze. The added volatility in STRIPS provides a benefit in a rebalanced portfolio. A multiperiod model can better capture the portfolio returns and pension surplus over time than a static analysis.

EXHIBIT 2

GM Defined-Benefit Pension System: 1989 – 2004

Year	Stock Price Per Share ($) (Jan 1)	Shares Outstanding (billion)	Company Market Value (billion $)	Company Growth Rate	Contribution (billion $)	Fair Value of Pension Assets (billion $)	ABO (billion $)	Surplus Wealth (billion $)	Funded Ratio
1989	32.74	0.606	19.83	1.01	n/a	40.052	35.595	4.457	1.13
1990	33.13	0.606	20.06	0.85	n/a	34.889	39.098	-4.209	0.89
1991	26.95	0.632	17.02	0.94	n/a	n/a	n/a	n/a	n/a
1992	22.64	0.707	16.00	1.14	n/a	n/a	n/a	n/a	n/a
1993	25.29	0.720	18.21	1.80	n/a	46.950	63.025	-16.075	0.74
1994	43.42	0.754	32.75	0.76	n/a	50.408	57.574	-7.166	0.88
1995	33.03	0.753	24.87	1.26	n/a	67.436	67.860	-0.424	0.99
1996	41.46	0.757	31.37	0.97	n/a	71.295	70.278	1.017	1.01
1997	43.72	0.693	30.32	1.09	n/a	71.295	72.501	-1.206	0.98
1998	50.41	0.655	33.02	1.11	n/a	72.280	73.570	-1.290	0.98
1999	59.38	0.619	36.78	1.11	0.86	75.007	76.963	-1.956	0.97
2000	74.63	0.548	40.91	0.70	5.03	80.462	73.269	7.193	1.10
2001	50.94	0.559	28.48	0.96	0.10	77.866	76.131	1.735	1.02
2002	48.60	0.560	27.24	0.76	4.91	67.322	76.383	-9.061	0.88
2003	36.86	0.565	20.81	1.45	18.50	60.860	79.617	-18.757	0.76
2004	53.40	0.565	30.17			86.169	87.285	-1.116	0.99

Sources: "Stock Price Per Share" from Datastream; "Shares Outstanding" from Value Line; data in last seven columns from annual reports.

From the standpoint of protecting the pension trust surplus, STRIPS have a higher duration and higher convexity than either Treasury bonds or high-yield bonds. The duration of the assets is more similar to the duration of the typical pension liability. This will reduce the volatility of both the funded ratio and the contribution. The surplus will be less susceptible to the risks of a market recession.

Accordingly, the sponsoring company is less likely to require a contribution during a market downturn. Contribution risk is particularly important when the company's profitability is closely linked with the overall economy. The advantages of long-duration government bonds have been touted by a number of others, including Arnott [2004].

A pension plan can be closely tied to the economic path of the sponsoring company. To illustrate, Exhibit 2 shows the historical pattern followed by General Motors since 1989. Several points are noteworthy.

First, pension assets significantly exceed the company's market capitalization. Second, the maximum market value of the company (early 2000) occurred at the same time as the high point for the pension assets. From 2000 to 2003, GM's market capitalization fell by $20 billion (from $40 to $20 billion), while pension assets fell by a similar amount (roughly $20 billion). To adequately fund the plan required a massive loan by GM. This historical pattern is similar in other companies, especially those in industries that are closely bound to the business cycle.

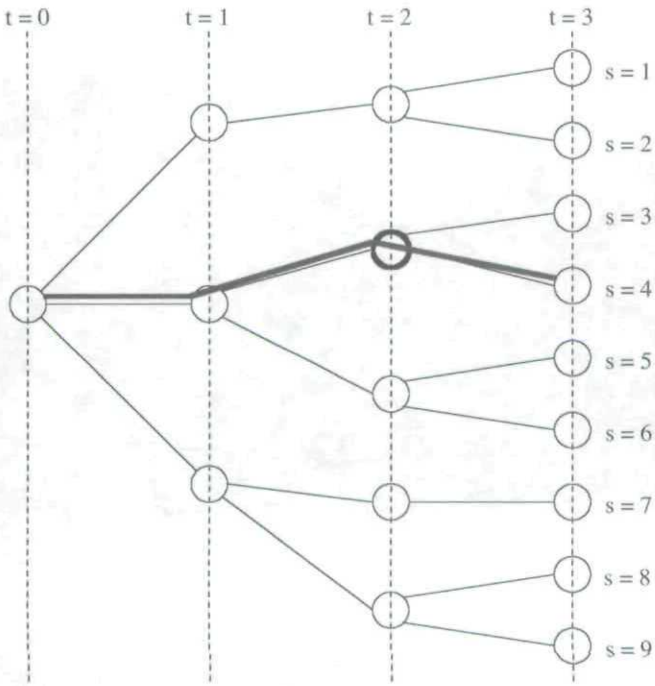
INTEGRATION OF THE PENSION TRUST AND SPONSOR COMPANY

One approach to integrating the defined-benefit pension trust with the company's financial plans starts with the standard scenario tree as shown in Exhibit 3. Such a tree is routinely employed to price options and other derivatives as well as accomplish many related tasks. For our purposes, we will not only compute the current value of assets and liabilities, but also project the future value of the pension plan and the sponsoring company over a nine-year planning period using Monte Carlo simulation.

An anticipatory approach is needed for several reasons. First, a pension trust affects a wide range of stakeholders with varying time horizons. It is essential that regulators, investors, current and future retirees, and company employees are presented with adequate information about the financial health of the pension plan. Since the

EXHIBIT 3

Example Scenario Tree



pension plan can have a significant impact on the sponsoring company, there is need for an anticipatory evaluation. Banks are routinely asked to conduct similar evaluations over shorter time periods. Our proposed system extends these forms of analysis.

Exhibit 3 displays the model as a network of cash flows (see Mulvey, Simsek, and Pauling [2003]). The network can be visualized as a series of points (nodes, for assets at time periods), connected by lines (arcs, for cash flows at various junctures). In each time period, we depict the major decisions and their consequences as arcs in this network.

For instance, a line connects the core company with the pension plan; flow over this arc represents a contribution from the company to the pension plan. Similarly, arcs that connect the cash nodes will model either purchases or sales of the associated asset category. Transaction costs will reduce the flow along any of the arcs, depending on the investor's circumstances. For example, a 30 basis point transaction cost will result in a multiplier equal to 99.7%.

The cash flows are affected by our decisions *and* the uncertainties via a set of *S* projected scenarios. Each scenario, *s*, takes its own network. The total model consists of *S* scenarios (also known as *S* networks). In Exhibit 4 the full set of uncertainties is shown as a scenario tree. The scenario process has been employed for many years at Towers Perrin and its Tillinghast business for asset liability management, asset allocation, capital allocation, and risk management (see Mulvey and Thorlacius [1998] and Mulvey, Gould, and Morgan [2000] for an overview). Similar scenario processes are described in Ziemba and Mulvey [1998] for pension trusts, insurance company dynamic financial analysis, and individual financial planning.

We make decisions at each time period in our network, corresponding to nodes in the scenario tree. For instance, the returns for each asset *j* in each time period are aligned along each scenario *s* as lines from the root node to the tree's leaves. Of course, the value of this event depends upon the action taken at the beginning of that time period *t*. The optimization model searches for the best compromise for all of the time periods, scenarios, and asset classes.

A novel feature of our integrated model is the full linkage of the company into the pension planning process. At each juncture (scenario and time period), we value the company along with the pension trust. For our initial tests, we use the capital asset pricing model (CAPM) so that the company's growth occurs as a function of the broad equity returns (in our case the S&P 500 index). This model can be readily expanded for multiple factors as needed.

The integrated approach allows for a variety of goals. We propose a set of desirable criteria that have proven effective in practice: 1) expected value of pension funding ratio (at various junctures such as one year and the horizon, year 9); 2) present value of contribution; 3) probability of making a large contribution; 4) volatility of asset returns over time; 5) variance of funding ratio at the horizon; and 6) probability of insolvency over the planning horizon. Typically, the pension plan administrator will seek a compromise among the goals. Mulvey, Simsek, Zhang, and Holmer [2004] and Mulvey, Fabozzi, Pauling, Simsek, and Zhang [2004] provide further discussion.

A final modeling element ensures that the integrated model does not take advantage of future information. To accomplish this task, we add a series of constraints, called *non-anticipatory conditions*. Birge and Louveaux [1997] discuss this issue in the context of a stochastic optimization model. Likewise, for Monte Carlo simulation, we must avoid advanced information when making decisions.

EXHIBIT 4
Network View of Integrated System

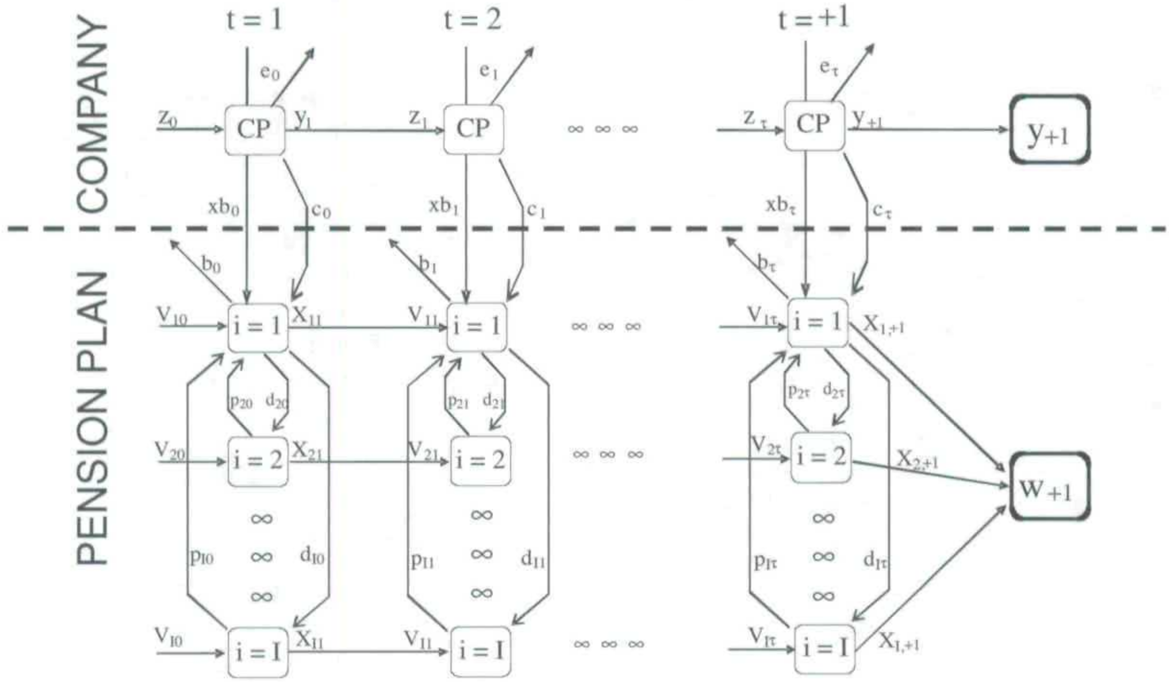


EXHIBIT 5
Status of DB Pensions in S&P 500 Index (early 2004)

S&P 500								
Funding Ratio	Number	Mean	Pension Assets/Obligation	Pension Assets (Bill. $)	Obligation (Bill. $)	Surplus Wealth (Bill. $)	Index Capital Value (Bill. $)	Ratio of Index Market Cap to Pension Assets
Total	342	0.81	0.83	1004.29	1213.80	-209.52	7534.03	7.50
<=1	299	0.75	0.79	875.34	1102.52	-227.18	6480.23	7.40
1<	43	1.26	1.16	128.94	111.28	17.67	1053.80	8.17
<=0.7	102	0.58	0.59	118.91	202.84	-83.93	1828.2	15.37
0.7< <=0.9	151	0.80	0.80	497.29	625.49	-128.20	3137.93	6.31
0.9< <=1	46	0.94	0.95	259.14	274.19	-15.06	1514.10	5.84
1< <=1.2	32	1.07	1.08	71.59	66.34	5.25	643.30	8.99
1.2<	11	1.81	1.28	57.36	44.94	12.42	410.50	7.16

SNAPSHOT OF INDUSTRY PROJECTIONS

There are 342 companies with defined-benefit pension plans in the S&P 500 index.* We apply the integrated pension plan/corporate planning methodology to study possible states of their systems over the next nine years. We want to show the range of outcomes, rather than forecast a single time series. We thus run many simulations using a wide range of assumptions.

Exhibit 5 describes the current state of the DB system (as of early 2004) for companies in the S&P 500. Nesbitt [2003] and Blitzer, Silverblatt, and Guarino [2004] provide similar details of the DB system. The great majority of companies are underfunded: 299 of 342. The system has an aggregate deficit equal to $210 billion. This deficit seems modest as compared with the total market capitalization of $7,534 billion. Pension assets equal $1,004 billion, 13.3%. The ratio of market capitalization to pen-

EXHIBIT 6

Status of Financial Companies in S&P 500

Financials								
Funding Ratio				Pension		Surplus	Industry	Ratio of Industry
	Number	Mean	Pension Assets/Obligation	Assets (Bill. $)	Obligation (Bill. $)	Wealth (Bill. $)	Capital Value (Bill. $)	Market Cap to Pension Assets
Total	59	0.89	0.93	86.42	92.95	-6.53	1785.90	20.67
<=1	45	0.81	0.87	60.80	70.16	-9.37	1466.00	24.11
1<	14	1.13	1.12	25.62	22.78	2.84	319.90	12.49
<=0.7	9	0.54	0.61	6.90	11.26	-4.36	166.30	24.11
0.7< <=0.9	17	0.81	0.85	15.89	18.70	-2.81	508.60	32.00
0.9< <=1	19	0.94	0.95	38.00	40.20	-2.20	791.10	20.82
1< <=1.2	10	1.07	1.09	19.82	18.23	1.60	266.60	13.45
1.2<	4	1.28	1.27	5.79	4.55	1.24	53.30	9.20

EXHIBIT 7

Status of Industrial Companies in S&P 500 (excluding GE)

Industrials (minus GE)								
Funding Ratio				Pension		Surplus	Industry	Ratio of Industry
	Number	Mean	Pension Assets/Obligation	Assets (Bill. $)	Obligation (Bill. $)	Wealth (Bill. $)	Capital Value (Bill. $)	Market Cap to Pension Assets
Total	48	0.80	0.82	205.18	250.73	-45.55	715.00	3.48
<=1	46	0.79	0.81	198.66	244.64	-45.98	699.10	3.52
1<	2	1.10	1.07	6.52	6.09	0.43	15.90	2.44
<=0.7	10	0.59	0.61	24.18	39.57	-15.39	106.10	4.39
0.7< <=0.9	23	0.79	0.81	119.06	146.93	-27.87	374.60	3.15
0.9< <=1	13	0.94	0.95	55.42	58.15	-2.73	218.40	3.94
1< <=1.2	2	1.10	1.07	6.52	6.09	0.43	15.90	2.44
1.2<								

sion assets is roughly 7.50 on average. Companies with the worst deficits (defined by funding ratios lower than 0.7) are about $83 billion below fully funded, out of $1,828 billion in market capitalization.

Viewed from this perspective, the overall problem appears manageable as long as the deficits do not continue to worsen. This conclusion assumes that the present value of liabilities has been properly calculated. And today there is disagreement about the proper approach for discounting the liability cash flows. (See Ryan and Fabozzi [2002] and Bader [2003] for further discussion regarding pension funding issues.)

Looking more carefully at the data, however, it becomes evident that the range of financial conditions is highly variable depending on the industry. The financial industry, for instance, is much more able to weather its current deficits. As Exhibit 6 shows, the deficit for financial companies in the S&P 500 (about $6.5 billion) is a small percentage of the total market capitalization of $1,785 billion. Even the worst companies in this industry (with funding ratios below 0.7) have substantial assets to support future contributions. The situation is similar in the health care industry (see Mulvey, Simsek, Zhang, and Holmer [2004]).

Other industries are less fortunate. Look at the industrial companies in the S&P 500 when we eliminate GE, for example (*Exhibit* 7). GE is an outlier with its relatively high funding ratio and more than 30% of the entire sector's market value. The remaining 48 companies have an aggregate deficit of $45.6 billion, with a market capitalization of $715.0 billion. Also, pension assets are a substantial percentage of the total market capitalization for this group of companies ($205 billion of $715 billion). Clearly, this industry has much at stake in the future of its DB pensions. Several other industries are in similar straits.

The current DB system shows a majority of secure companies with modest deficits (relative to market value), but several industries face severe difficulties. There is a great

EXHIBIT 8

Summary of Assumptions for Forward Simulations

Primary Objective	Maintain the funding ratio to 90% at the end of horizon.
Asset Classes	SP500 – EAFE – Treasury Bonds – Cash
Borrowing Funds borrowing rate	5% of the initial industry market value in the first period. Cash return + 3%
Plan Liabilities benefit payment patterns discount rates	Each year, project a 20-year benefit payment cash flow with the following: 1) Drug pattern (steadily increasing); 2) Auto pattern (first increases slowly and then declines); 3) - 5) Linear patterns with growth rate 2.5%, 4.5%, 6.5%. Long government bond rates
Contribution Rules if initial funded ratio < target ratio if initial funded ratio ≥ target ratio	 1) linear 2) concave 3) highly concave 4) convex* increase to the target.

* The shape of the path of funding ratio requirement to achieve the target is varied according to several assumptions. A concave shape will make earlier contributions than a convex shape.

EXHIBIT 9

Projections of Industries in S&P 500 over 9-Year Horizon 2005-2013 (based on CAPM)

Index	12/30/1994 to 04/30/2004 Expected Return	Volatility	Correlation with S&P 500	Annualized Geo. Ret.	Expected Return Used in the simulations*
S&P 500 COMPOSITE	12.30%	20.80%	100.00%	11.76%	9.42%
ENERGY	11.97%	16.48%	80.06%	12.71%	9.17%
MATERIALS	6.98%	16.31%	48.40%	7.04%	5.35%
INDUSTRIALS	12.03%	19.22%	90.46%	11.92%	9.22%
CONSUMER DISCRETIONARY	12.57%	20.41%	88.45%	11.46%	9.63%
CONSUMER STAPLES	11.53%	17.46%	49.72%	11.95%	8.83%
HEALTH CARE	16.83%	21.90%	76.92%	16.27%	12.89%
FINANCIALS	18.09%	22.17%	81.03%	17.72%	13.85%
INFO TECHNOLOGY	20.27%	43.18%	87.22%	12.81%	15.52%
TELECOM SERVICES	7.08%	31.86%	84.42%	4.21%	5.42%
UTILITIES	7.52%	22.66%	59.50%	6.41%	5.76%

* These numbers are adjusted to fit the S&P 500 scenario data.

deal of concentration in the DB problem areas.

To demonstrate this point, we apply an integrated system to project the status of the pension system and plausible values of the sponsoring companies over the nine-year period 2005 to 2013. A set of 5,000 scenarios form the basis for the projections. This system has been used for many years by a well-known actuarial firm.

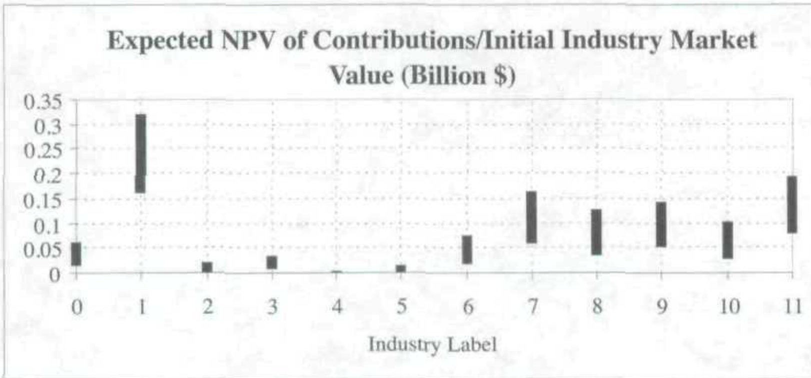
To reduce the impact of the assumptions, we examine a large number of alternative investment and contribution strategies. The objective of the analysis is to determine a range of plausible results over the nine years. We summarize the assumptions in Exhibits 8 and 9.

A summary of the preliminary results for the DB pensions in the S&P 500 over the period 2005-2013 appears in Exhibits 10 and 11. Here, we see that the average present value of contributions ranges roughly from 2% to 6% of total market capitalization. This seems reasonable, given the importance of the DB system as a benefit for many employees.

For certain industries, the situation is less optimistic. Four industries in particular will need substantial future contributions, on average: consumer discretionary, materials, utilities, and industrials (without GE). Actual contributions may vary widely from the expected value, and the integrated system supplies this range as needed. We show merely the disparity in projected values. It is likely that this disparity will not be settled by future economic conditions alone.

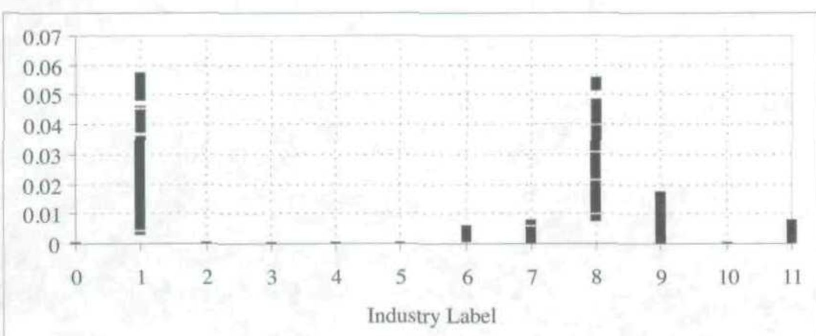
The forward-looking simulations provide additional information regarding the projected financial health of selected industries. Exhibit 11 indicates that the telecommunication services industry may require a large contribution (over 30% of market capitalization) over the next nine years. This event is caused primarily by the projected

EXHIBIT 10
Projections of DB System over 9 Years (2005-2013)



Industry labels: S&P 500 COMPOSITE = 0. CONSUMER DISCRETIONARY = 1. CONSUMER STAPLES = 2. ENERGY = 3. FINANCIALS = 4. HEALTH CARE = 5. INFO TECHNOLOGY = 6. MATERIALS = 7. TELECOM SERVICES = 8. UTILITIES = 9. INDUSTRIALS = 10. INDUSTRIALS WITHOUT GE = 11.

EXHIBIT 11
Probability of Any Excessive Contribution



Industry labels: see Exhibit 10.

slow growth of the industry relative to other industries in the S&P 500 index. It seems wise to monitor companies and industries that may face problems in the future, even if these companies appear healthy at present.

RECOMMENDATIONS

The defined-benefit pension system in the United States can regain its health by modernizing the regulatory environment in conjunction with some industrywide evaluation. Several steps are suggested to improve the long-term viability of the DB system.

First, annual forward-looking integrated evaluations should be required for DB pension trusts. Such an evaluation should link assets, liabilities, and the company's ability to fund contributions. The technology is available today for this analysis. European pension trusts commonly use asset and liability management studies. A source at a large Dutch fund stated:

> ALM is a key tool to deliver quantitative-based information to our board of trustees. It allows for investigating the impact of various investment, contribution, indexation, and financing policies; as such, it supports decision making at strategic levels (Fabozzi, Focardi, and Jones [2004], p. 14).

A company should be able to show that it can support its obligations via modern financial engineering tools.

Second, multiyear smoothing procedures should be reduced or eliminated after a transition period. Companies that require reduced volatility can readily attain that state by applying a hedging strategy. Other companies that wish to assume additional risks for possible higher gains must clearly provide a strategy for supporting their obligations.

Third, given a forward looking analysis, companies that are losing their ability to fund future benefits should undergo greater scrutiny and perhaps increased fees by the PBGC. Likewise, if a company improves the probability of solvency, PBGC fees should be reduced.

A perplexing issue involves the status of companies and perhaps industries for which the required contribution will prove so burdensome as to affect the company's ability to survive. We show this may occur unless equity markets produce large gains over the next few years. What can be done?

Government subsidies may be needed. The entire DB system is at risk if healthy companies are required to support the pensions of highly concentrated poorly funded industries. In this case, the two most robust industries, health care and finance, may have an incentive to exit their DB plans to the extent they can. The DB system could implode via a cascade of losses.

Our proposed methodology applies to both types of

DB plans—traditional and cash balance. Cash balance plans have advantages for selected groups, especially younger workers who are likely to change jobs, and these may become the predominant form. For both types of DB plans, the sponsoring company should apply modern financial engineering tools.

We have described one approach to addressing the future financial health of the defined-benefit pension system. Undoubtedly, other analytical approaches will be developed. This is a significant national concern.

ENDNOTE

*Our information on the S&P 500 companies comes from the Value Line database.

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