United States Government Accountability Office

GAO

Report to Congressional Requesters

June 2011

PENSION BENEFIT GUARANTY CORPORATION

Asset Management Needs Better Stewardship

GAO-11-271

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Asset Management Needs Better Stewardship

GAO Accountability • Integrity • Reliability

Highlights

Highlights of GAO-11-271, a report to congressional requesters

Why GAO Did This Study

The Pension Benefit Guaranty Corporation's (PBGC) insures the pension benefits of more than 44 million people. Since its inception in 1974, PBGC's assets have grown from about $34 million to almost $80 billion in 2010, largely through assets received in plan terminations. Despite significant swings in PBGC's investment history, there has been little focus on the extent to which it has met its investment goals, the nature of its investment policies or how they compare with best practices in the industry. GAO examined (1) how PBGC's investment objectives have changed over time and the outcomes associated with those changes, (2) the performance of PBGC's investments, and (3) how well PBGC's investment policies and operations comport with best practices in the industry. To address these questions, GAO reviewed PBGC's investment policy statements and operational procedures; analyzed data on investments; and interviewed PBGC officials, officials from several state pension plans and foreign pension insurers, and other experts.

What GAO Recommends

GAO recommends that the PBGC and its board of directors (1) develop and maintain comprehensive investment policy statements and (2) develop a complete set of operating procedures and guidelines for its investment activities. GAO received comments from the Department of Labor and the PBGC. They generally agreed with our recommendations.

View GAO-11-271 or key components for more information, contact Barbara Bovbjerg at (202) 512-7215 or Bovbjergb@gao.gov.

What GAO Found

PBGC's investment objectives and stated asset allocation targets have changed frequently in the last 8 years, alternating between more conservative and more aggressive approaches to investing. Yet these changes in stated objectives had only a moderate effect on PBGC's actual asset allocation because, for a variety of reasons, PBGC did not meet its targets. In our review of their investment history, we found that PBGC did not routinely monitor transaction costs related to its policy shifts and, at certain times, significant transaction costs were incurred. For example, we determined based on data obtained from PBGC's investment managers that nearly $75 million in transaction costs were incurred during the economic downturn which coincided with the period when the 2008 policy was being implemented and subsequently suspended.

Using seven benchmarks, one of which was a Pension Protection Act benchmark that GAO constructed, GAO's analysis shows that PBGC's investments performed better than most benchmarks on an asset-only basis, but tended to underperform all seven of the benchmarks when returns were assessed together with the growth in liabilities. GAO notes that both analyses have limitations and can be seen by some experts as incomplete. However, GAO's method of analysis is consistent with how financial economics literature suggests investment performance analysis should be conducted. Finally, GAO's analysis found no apparent adverse effect on PBGC's investment performance as a result of changes in policy.

PBGC's policy statements and operating procedures are incomplete and do not provide sufficient guidance to ensure sound implementation of its investment policies. The investment policies issued by PBGC's board for strategic guidance in the planning and execution of investments have generally lacked a number of provisions recommended by the Chartered Financial Analyst Institute; Independent Fiduciary Services; and other experts of sound investment management, such as the Government Finance Officers Association. Moreover, according to our review and based on interviews with PBGC staff, the policy statements have been insufficiently detailed to provide adequate guidance for staff. In addition, PBGC's Corporate Investments Department's staff have largely functioned without the benefit of fully-developed and documented operating procedures.

Although PBGC has grown from a relatively small agency to one holding almost $80 billion in assets, its policies and procedures still reflect in many ways its small agency past. To ensure that PBGC can effectively and consistently meet its obligation to manage a fund of this size and its liabilities, PBGC's board and its management must enact better stewardship, standards, and procedures to ensure that PBGC can effectively and consistently meet its obligation to conduct the many investment related functions it performs.

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Abbreviations

CID	Corporate Investment Department
ERISA	Employee Retirement Income Security Act of 1974
PBGC	Pension Benefit Guaranty Corporation
PPA	Pension Protection Act of 2006

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Accountability * Integrity * Reliability

United States Government Accountability Office
Washington, DC 20548

June 30, 2011

The Honorable Sander M. Levin
Ranking Member
Committee on Ways and Means
House of Representatives

The Honorable Charles B. Rangel
House of Representatives

The Pension Benefit Guaranty Corporation (PBGC) insures the pensions of more than 44 million private sector workers and retirees who are covered by more than 27,500 private defined benefit pension plans. Created in 1974 as a federal guarantor of these plans, PBGC finances its operations through insurance premiums paid by plan sponsors, funds received from terminated pension plans, and money earned from the investment of these funds.[1] Despite PBGC's financial holdings of almost $80 billion, the agency currently faces a cumulative deficit of more than $23 billion. Alternating between more conservative and more aggressive investment strategies, PBGC has revised its investment policy several times since its inception. You asked us to study:

- how PBGC's investment objectives have changed over time, whether policy goals were met, and what impact have those changes had on transaction costs;
- how changes in investment policy have impacted investment returns; and
- what methodology did PBGC use to execute investment policy changes over the past 10 years and how well did PBGC comport with best practices in the industry in terms of development, execution, and oversight of its policies.

To answer these questions, we collected and analyzed information using several methods. To identify changes to PBGC's investment objectives, policies, and associated costs, we examined the agency's investment policy statements, interviewed agency staff responsible for implementing them, and obtained data on costs from staff and transition managers. Our

[1]Employee Retirement Income Security Act of 1974, Pub. L. No. 93-406, tit. IV, 88 Stat. 829, 1003-35 (codified as amended at 29 U.S.C. §§ 1301-1461).

analysis did not include PBGC's recently released investment policy statement in late May 2011, since it was issued just after the completion of our audit work. To analyze the performance of PBGC's investments, we also obtained PBGC data on assets and liabilities and conducted a portfolio performance evaluation of PBGC's Single Employer Total Fund's monthly returns from October 1976 to December 2009. This analysis compared the fund's return performance to that of several benchmark portfolios using a variety of portfolio performance statistics. To determine how well PBGC comported with industry best practices regarding the development, execution, and oversight of their policies, we reviewed investment policy guidance from the Department of Labor, the Chartered Financial Analyst Institute, and the Government Finance Officer's Association. We then compared policy elements from such guidance with PBGC's investment policies, and interviewed PBGC staff, a former PBGC director, members of the Investment Advisory Committee, and board representatives to obtain information about PBGC operations. We also interviewed and examined documents from domestic private and public insurers, domestic pension plan sponsors, and foreign public insurers. For additional discussion of our scope and methodology, see appendix I.

We conducted this performance audit from June 2009 through May 2011 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

The Employee Retirement Income Security Act of 1974 (ERISA) created PBGC as a government agency to help protect the retirement income of U.S. workers with private-sector defined benefit plans by guaranteeing their benefits up to certain legal limits.[2] PBGC administers two separate insurance programs for these plans: a single-employer program and a multiemployer program. The single-employer program covers about 34 million participants in approximately 26,000 plans. The multiemployer program covers 10 million participants in another 1,500 collectively bargained plans that are maintained by two or more unrelated employers. If a multiemployer pension plan is unable to pay guaranteed benefits when

[2]29 U.S.C. §§ 1322 and 1322a.

due, PBGC will provide financial assistance to the plan, in the form of a loan, so that benefits may continue to be made up to the guaranteed benefit limits.[3] However, if the sponsor of a single-employer plan is in financial distress and does not have sufficient assets to pay guaranteed promised benefits, the plan will be terminated and PBGC will likely become the plan's trustee, assuming responsibility for paying benefits to participants as they become due, up to the guaranteed benefit limits. Most of PBGC's $102.5 billion in liabilities are due to future benefit payments owed to participants of underfunded plans terminated under the single-employer insurance program.

To finance these liabilities, PBGC currently has approximately $80 billion in assets. PBGC's funds primarily come from three sources: insurance premiums paid by sponsors of defined benefit plans, assets acquired from terminated plans, and investment income earned on these assets.[4] For example, in 2010 all plans insured by PBGC paid a total of approximately $2.3 billion in premiums. In addition, PBGC took over the assets from 147 defined benefit plans in fiscal year 2010, which totaled approximately $1.8 billion. Finally, over the course of the same year, PBGC recorded $7.8 billion in earnings from its investment portfolio, including interest, dividends, and capital gains.

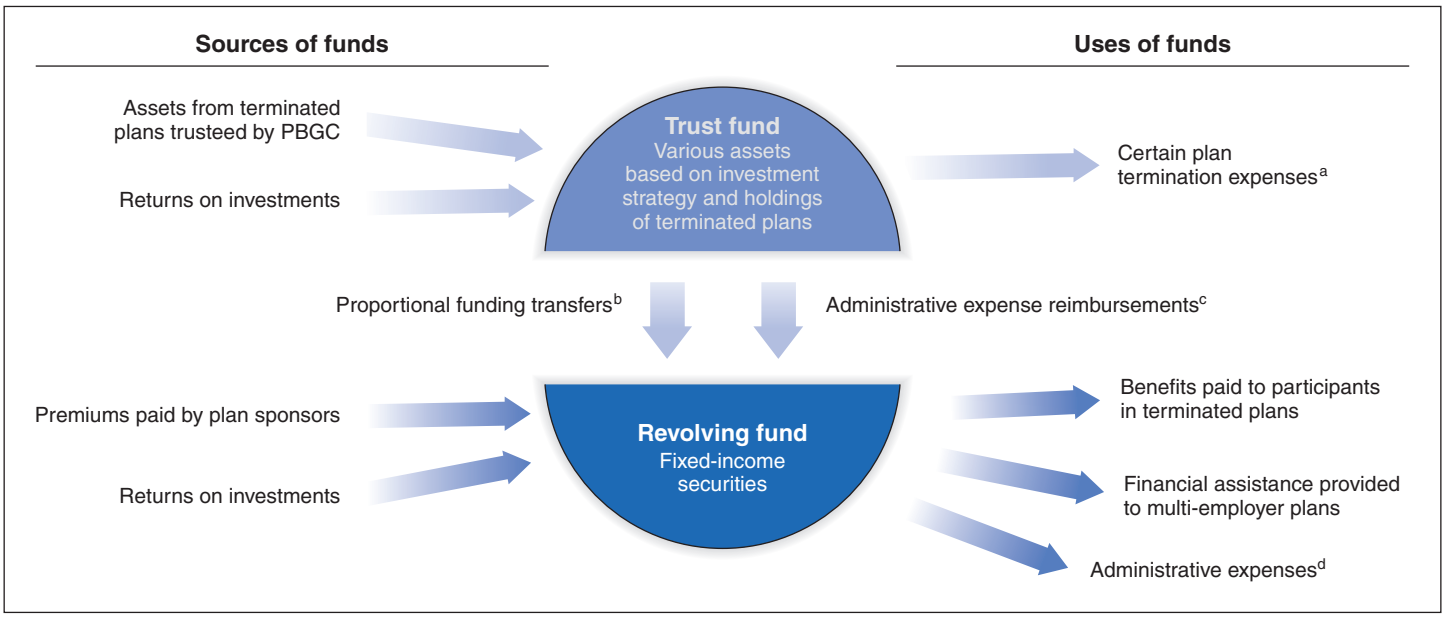
PBGC holds its assets in essentially two separate funds: the PBGC trust fund and the PBGC revolving fund (see fig. 1).[5] The PBGC Trust Fund holds assets received from terminated plans and the return on investing the assets held in the trust fund, while the PBGC Revolving Fund consists of premium receipts and the return on investing the premium receipts. Benefit payments and financial assistance are paid from the revolving fund, and then the trust fund reimburses the revolving fund through a proportional payment at least annually.

[3]29 U.S.C. § 1361.

[4]29 U.S.C. § 1305(b).

[5]Although ERISA provided for the establishment of seven revolving funds (29 U.S.C. § 1305), PBGC uses only three such funds in carrying out its duties. In this report we refer to them as a single revolving fund.

Figure 1: Revenue Sources and Uses of PBGC's Funds



Source: GAO presentation of information in PBGC 6/1/2010 draft policy manual, "Pension Benefit Guaranty Corporation Corporate Investment Department Policies and Procedures Manual."

[a]Certain expenses related to plan terminations can be paid directly by the PBGC Trust Fund.

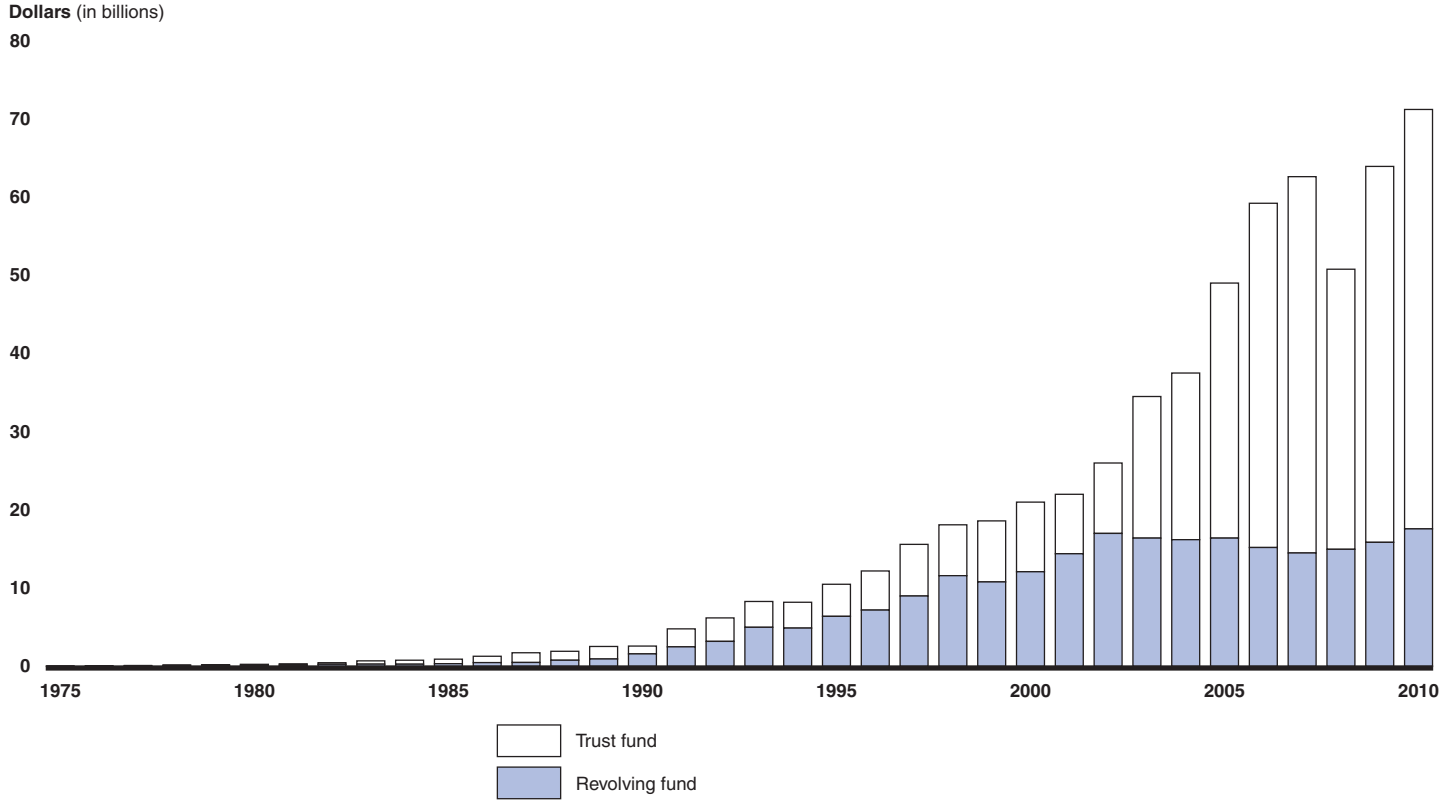
[b]The PBGC Trust Fund reimburses the PBGC Revolving Fund for its share of payments made to beneficiaries with a proportional payment made at least annually. The formula for calculating this payment is: net trust fund assets divided by the present value of future benefits excluding probable terminations.

[c]The PBGC Trust Fund reimburses the PBGC Revolving Fund for all administrative expenses initially paid by the revolving fund.

[d]Administrative expenses include such items as payroll and payment of invoices.

PBGC has grown significantly since the end of its first year of operation. As of June 30, 1975, the agency had $34 million in assets and $1.2 million in liabilities. At the end of fiscal year 2010, however, the trust and revolving funds combined contained about $80 billion in assets (see fig. 2), to cover total liabilities of $102.5 billion, leaving a deficit of approximately $23 billion.

Figure 2: Growth of PBGC's Trust and Revolving Funds, 1975 to 2010



Source: GAO analysis of PBGC data.

PBGC is governed by a three-member board of directors, which consists of the Secretary of Labor (Chair), the Secretary of the Treasury, and the Secretary of Commerce.[6] The board is responsible for policy direction and oversight of PBGC's finances and operations. The board of directors is responsible for establishing and overseeing the policies of the corporation, including the approval of the corporation's investment policy statement.[7] Under its bylaws, the board is required to review the corporation's investment policy statement at least every two years and approve the investment policy statement at least every four years.[8] Each board member

[6]29 U.S.C. § 1302(d).

[7]29 C.F.R. § 4002.3(a)(3) (2011).

[8]29 C.F.R. § 4002.3(a)(4) (2011).

must designate an official (not below the level of an assistant secretary) to support the board's oversight. Board representatives are given the authority to act for all purposes under the bylaws, subject to some actions—such as approving the corporation's investment policy statement—being ratified by the board members.[9] The board members often rely on these department representatives to conduct much of their PBGC related work on their behalf.

PBGC uses institutional investment management firms to invest its assets, subject to the agency's oversight and in accordance with the investment policy statement as approved by its board and applicable legal requirements. For example, ERISA provides different requirements concerning how the assets held in the revolving fund and the trust fund can be invested. ERISA requires the PBGC Revolving Fund to be, in part, invested in U.S. obligations.[10] PBGC has more flexibility to invest trust fund assets in other investments, and, along with revolving fund investments, the corporation's investment policy statement provides direction on how these assets are to be invested. With respect to the trust fund, PBGC does not determine the specific investments to be made, but instead relies on its investment managers' discretion to invest a portion of the funds consistent with the benchmarks and risk criteria provided to each investment manager. When PBGC receives assets from terminated plans, PBGC determines whether the assets fit into the agency's current investment policy objectives. For incoming assets that do not fit with their current policy, PBGC uses investment managers to liquidate them, as soon as practicable, and then reinvests the proceeds into assets that do align with PBGC policy.

In its role as an insurer, PBGC's responsibilities are similar to those of other institutions that conduct such functions. However, the corporation also faces structural challenges that are not shared by other insurers, which gives the corporation less control over the terms by which it insures pension plans and constrains its ability to manage its risk of loss (see table 1). For example, in contrast with information provided by pension insurers in Canada and the Netherlands, PBGC tends to have less control over the

[9]29 C.F.R. § 4002.3(b) (2011). Each of the board members may also designate an official (not below the level of an assistant secretary) to serve as an alternative representative.

[10]29 U.S.C. § 1305(b)(3). By statute, PBGC is restricted to investing some revolving funds in U.S. obligations which are fixed-income assets. Other revolving funds may be invested as PBGC considers appropriate, but current policy is to invest them in U.S. Treasury securities. 29 U.S.C. § 1305(b)(3) and (f)(3).

terms by which it insures pension plans. Only Congress, through legislation, can change premiums or plan funding requirements for defined benefit plans in the United States.[11]

Table 1: Similarities and Differences between PBGC and Other Institutions

	Similarities	Differences
Life insurers, and property and casualty insurers	• Like some life insurers, PBGC often has a long-term investment horizon. • Like some property and casualty insurers, PBGC often has unpredictable liabilities that require a certain amount of liquidity.	• Unlike insurance companies, PBGC is unable to set the level of premiums that it receives from plan sponsors to insure their plans. • Unlike insurance companies, PBGC must take on new beneficiaries, irrespective of the financial health of the terminated plans.
Foreign pension insurers	• Like some foreign pension insurers, PBGC is responsible for paying benefits to participants of plans that it has taken over.	• Unlike one foreign pension insurer, PBGC cannot change the terms under which it insures a pension plan or impose a higher premium on a plan that takes on significant investment risk. • Unlike one foreign pension insurer, PBGC cannot reduce benefit payments to participants in order to protect its own financial health. • Unlike another foreign pension insurer, PBGC cannot require the reduction of benefit accrual rates in order to improve the funded status of a plan. • Unlike one foreign pension insurer, PBGC lacks the ability to change funding rules applicable to the plans that it insures.

Sources: GAO analysis of pension insurance information provided by Canada (Ontario), the Netherlands, Switzerland, and the United Kingdom; life and property and casualty insurer information provided by John Hancock, AIG Property and Casualty, and State Farm Property and Casualty.

Beginning in 2003, recognizing PBGC's long-term financial challenges, we included PBGC's single-employer insurance program on our list of "high-risk" programs needing attention and congressional action;[12] in 2009, we

[11]For example, the Pension Protection Act of 2006 included a number of provisions aimed at improving plan funding and PBGC finances by raising premiums, including variable premiums for plans with low reserves. Pub. L. No. 109-280, 120 Stat. 780. It also raised the funding requirements defined benefit pension plans must meet for Internal Revenue Service qualification. The Worker, Retiree, and Employer Recovery Act of 2008 provided plan sponsors with temporary further relief from the changes in the Pension Protection Act of 2006 (Pub. L. No. 110-458, 122 Stat. 2092), as did Internal Revenue Service guidance in 2009 concerning interest rates that could be used to value plan liabilities in some cases. More recently, the Preservation of Access to Care for Medicare Beneficiaries and Pension Relief Act of 2010 provided relief to private-sector pension sponsors, in part, by allowing certain sponsors to elect one of two possible schedules to reduce or delay contributions attributable to certain funding shortfalls stemming from the economic downturn. Pub. L. No. 111-192, 124 Stat. 1280

[12]GAO, *High-Risk Series: An Update*, GAO-07-310 (Washington, D.C.: January 2007).

added PBGC's multiemployer program as a program of concern.[13] Both programs remain on our high-risk list today.[14]

Frequent Policy Changes Occurred, but Changes to Actual Asset Allocation Were Moderate

PBGC's investment policy has changed frequently since 1990, alternating between more conservative and more aggressive approaches to investment.[15] The frequent changes in policy have had a moderate impact on PBGC's actual allocation of assets since 1976 because there were no allocation targets in place prior to 1990 and the policy targets after that time were rarely ever met. Meanwhile, the transaction costs for the reinvestment of assets during each policy period have fluctuated with shifts in the market.

PBGC's Investment Objective Changes Have Had Moderate Effect on Actual Asset Allocations

Since 1990, PBGC has shifted its investment policy five times. The shifts in investment policy that occurred in 1990 and 2004 were aimed at strategies that immunized against interest rate exposure by increasing the allocation of fixed-income securities. PBGC's investment policy was shifted in 2009 to a more conservative strategy of taking on a higher allocation of fixed-income securities.[16] In contrast, shifts in investment policy that occurred in 1994 and 2008 were aimed at strategies that maximized returns by increasing the allocation of equities. Shifts in policy of this frequency are thought to reflect an undisciplined approach to investing. Experts we interviewed stated that a more disciplined approach would require that PBGC change its investment policy no more than once every 5 to 7 years, except to review the policy during unusual circumstances, such as the recent market crash or when taking over the assets of a large terminated plan.[17] They noted that it can take up to 5 years for a policy to be fully implemented and to have an impact that can be evaluated. Moreover, these experts stated that a long-term and disciplined investment policy is needed

[13]GAO, *High-Risk Series: An Update*, GAO-09-271 (Washington, D.C.: January 2009).

[14]GAO, *High-Risk Series: An Update*, GAO-11-278 (Washington, D.C.: February 2011).

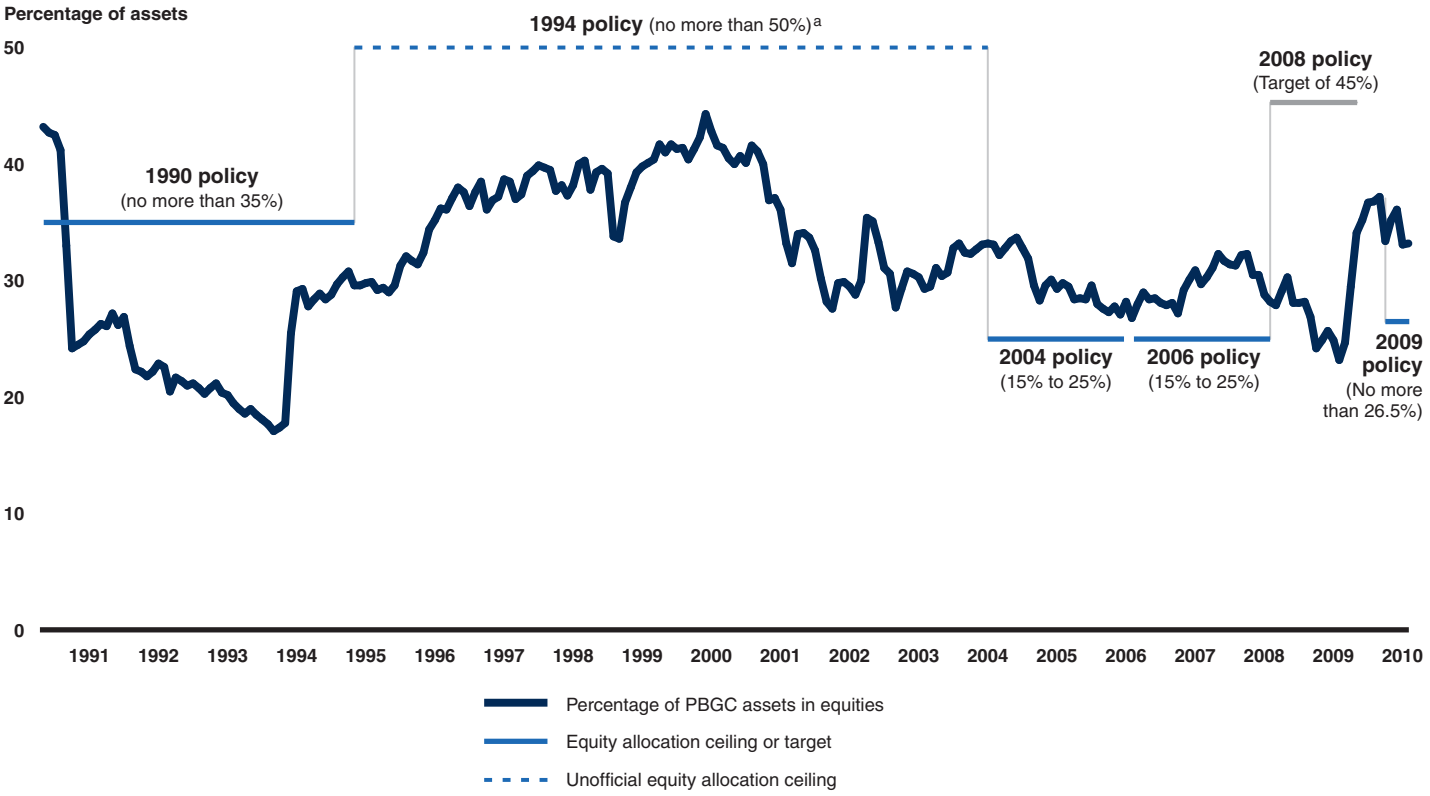
[15]During relatively conservative investment periods, allocation targets were aimed at increasing the proportion of fixed-income investments. During relatively aggressive investment periods, allocation targets were aimed at increasing the proportion of equity investments.

[16]In 2009, PBGC's investment policy shifted to a more conservative strategy but not for the purpose of immunizing against interest rate risk. The 2009 interim policy consisted of 26.5 percent in equity assets and 73.5 percent in fixed income assets.

[17]Under its bylaws, the board is required to review its investment policy statement at least once every two years and approve it at least every four years. 29 C.F.R. § 4002.3(a)(4) (2011).

in order to minimize the costs associated with shifts in policy.[18] Since 1990, PBGC's investment policy was in place for more than 5 years only once—during the period from 1994 to 2004. All other policies were in place for shorter periods, generally about 2 to 4 years (see fig. 3).

Figure 3: PBGC's Actual Equity Allocations Compared to Targets, 1991 to 2010



Source: GAO analysis of PBGC data.

Note: For the entire graphic, the policy years and the axis years do not line up exactly because of a lag between when a policy statement is released and when the policy begins to be implemented. Also, the policy change from 2004 to 2006 was the addition of the international fund, though the target percentages did not change.

[a]No explicit asset allocation was specified in the corporations investment policy statement, but the policy did set a ceiling for PBGC's equity allocation of 50 percent.

[18]For example, experts noted that a long-term and disciplined policy is needed to prevent market timing, which is the practice of buying or selling assets by attempting to predict future market price movements. According to experts, this practice can incur significant opportunity costs—that is, costs incurred as a result of market movements during a transaction.

PBGC's actual allocation of its total assets (both revolving fund and trust fund combined) reflects these changes in policy to some extent, but the impact has been tempered by a number of factors. First, PBGC must comply with certain statutory investment restrictions.[19] Therefore, because PBGC only invest the assets of its revolving fund in U.S. obligations which are fixed-income securities, accomplishing its investment policy goal is, in effect, limited to reallocating the assets of its trust fund —that is assets acquired from terminated plans under PBGC trusteeship. Second, during the period between 2004 and 2008, PBGC adopted the practice of using only assets of newly terminated plans to move toward new allocation targets, rather than reinvesting assets already in its trust fund. When in place, this practice further limited the amount of assets PBGC could use to meet its target allocations. Third, market conditions, at times, hindered PBGC in reaching its allocation targets by reducing the overall value—and as a result, the proportion—of assets invested in a particular sector. Finally, the frequency with which allocation targets changed also affected PBGC's ability to make significant changes in its allocation. During each period a policy was in place, PBGC made progress toward reaching new allocation targets with varying success before a new policy was adopted.

1990 to 1994

In May 1990, PBGC adopted a new investment policy calling for a decrease in the proportion of equities to no more than 35 percent of its portfolio. This policy was initiated by PBGC's then newly appointed executive director in response to both an increase in unfunded liabilities and to the results of a commissioned study that examined PBGC's liabilities and investment options. The study of PBGC's trust and revolving funds together recommended that PBGC reduce its equity exposure and increase its allocation in long-duration fixed-income assets. Accordingly, PBGC adopted a new investment policy that focused on matching its assets with its liabilities and targeted an asset allocation of no more than 35 percent in equities and no less than 65 percent in fixed income. In 4 months, PBGC decreased its equity allocation from 43 percent to 33 percent and was able to maintain this allocation range throughout the period for which the 1990 policy was in effect.

1994 to 2004

In October 1994, PBGC adopted a new investment policy that focused on maximizing the return on its investments by investing more heavily in equities in order to reduce the agency's deficit by achieving higher rates of return. Although no explicit asset allocation was specified in the

[19]29 U.S.C. § 1305(b)(3) and (f)(3).

investment policy statement, PBGC's 1994 annual report stated that, along with the adoption of the new investment policy, the agency had raised its ceiling for its equity allocation to 50 percent. The assets in PBGC's revolving fund is, pursuant partially to statute and partially to PBGC policy, invested only in U.S obligations which are fixed-income assets, hindering PBGC's efforts to increase its overall equity allocation.[20] However, in the years that followed, the agency attempted to raise equity levels by investing all its trust fund assets into equities. In this way, over the course of fiscal year 1994, PBGC increased its actual equity allocation from 17 percent to 30 percent. During the subsequent 7 years this policy was in place, PBGC's equity allocation peaked in 1999 at 44 percent, and over the period, averaged about 35 percent according to data provided by the agency.

2004 to 2006

In 2004, PBGC adopted a new investment policy that would, similar to the 1990 policy, match PBGC's assets to its liabilities by emphasizing fixed-income investments and limiting exposure to market risk. The 2004 policy reduced the allocation target for equities down to the 15 to 25 percent range and raised the allocation target for fixed-income securities to 75 to 85 percent. To implement this policy, however, PBGC's board directed staff to use only assets acquired from newly terminated plans, rather than to transition core trust fund assets already under management. As a result, according to PBGC officials, the volume of assets available to transition toward the target allocations was limited and the agency was not able to lower its allocation of equities down to the target range during the time this policy was in effect.

2006 to 2008

In 2006, PBGC adopted a new policy as a result of its biennial review process.[21] It allowed PBGC to invest in international securities, a departure from the past. The agency's overall investment policy, however, remained the same, with equity allocation targets set at 15 to 25 percent and fixed-income allocation targets set at 75 to 85 percent. Despite this new policy, once again, PBGC officials said that the agency did not receive enough in newly trusteed assets to be able to shift its equity allocation down to this target range. Also, during most of this period, the returns on PBGC's equity investments outpaced those of its fixed-income investments, further hindering the agency's attempt to reach this allocation target. Equities

[20]29 U.S.C. § 1305(b)(3) and (f)(3).

[21]According to PBGC, this biennial review was as a result of a PBGC Office of the Inspector General recommendation.

were achieving returns of 11 to 17 percent in fiscal years 2006 and 2007, while the returns of its fixed-income investments were around 1 to 3 percent annually. Hence, according to PBGC, the actual allocation hovered between 27 to 32 percent in equities and 67 to 72 percent in fixed income throughout this period.

2008 to 2009

PBGC changed its investment policy again in 2008 with the goal of seeking to maximize returns on its investment. To this end, PBGC adopted an investment policy with target asset allocations of 45 percent in equities; 45 percent in fixed income; and 10 percent in alternative investments, such as real estate and private equity. In addition, the policy called for expansion into two new subclasses of fixed-income securities: high yield and emerging market debt. In February 2008, when the policy was adopted, 28 percent of PBGC's assets were invested in equities. To move quickly toward its newly adopted allocation targets, PBGC decided to abandon its practice of relying only on newly acquired assets from terminated plans to transitioning a portion of core trust fund assets as well. PBGC transitioned nearly $5.7 billion from its existing trust fund investments in fixed-income securities to equities. Despite these efforts, the financial crisis and a 35 percent decline in the New York Stock Exchange Composite Index between early February 2008 and May 2009[22] caused PBGC's actual equity allocation to drop to as low as 23 percent during this period.

2009 to Present

In May and June 2009, PBGC's three board members issued a resolution instructing staff to cease implementing the 2008 investment policy.[23] This resolution was in response to an investigation, conducted by PBGC's Inspector General, concerning potential conflicts of interest involving PBGC's then Director with securing asset managers for the agency's portfolio. Transactions already initiated were allowed to proceed, but no new transactions were permitted until the board representatives issued investment policy guidance in July 2009, since the board had not also issued a new investment policy statement after it ceased the 2008 policy. Instead, this new interim policy called for a return to the actual portfolio composition as it was on March 31, 2009, which was 26.5 percent in equities and 73.5 percent in fixed income. This interim guidance served as

[22]Based on GAO analysis of the New York Stock Exchange Composite Index during the period between February 1, 2008, and May 31, 2009.

[23]The resolution was executed by each board member on different dates. The Secretary of Commerce executed the resolution on May 19, 2009, followed by the Secretary of Labor on May 21, 2009, and the Secretary of the Treasury on June 30, 2009.

the official policy.[24] Since then, PBGC has transitioned its newly acquired assets to fixed-income investments. Nevertheless, the performance of the equities market improved enough that as of September 2010, equities made up 31 percent of PBGC's portfolio.

Transaction Costs Have Fluctuated with Shifts in the Market

While the actual distribution of PBGC assets has remained within a fairly narrow range since 1990, the transaction costs incurred for the reinvestment of assets during each period a policy was in place have fluctuated with shifts in the market. Some transaction costs are always incurred with the assumption of assets from newly terminated plans and with the management of existing investments,[25] but the magnitude of these costs can vary dramatically depending on the volume and type of assets being transitioned, the investment policy or goal in place, and the market conditions during the transition period.[26] PBGC does not have a routine process for tracking the transaction costs associated with different investment policies, and does not consider these costs when developing new investment strategies.

Transaction costs for reinvestment of assets generally consist of commissions, fees and certain taxes (referred to as explicit costs), and opportunity costs, due to market changes during the transaction (referred to as implicit costs).[27] PBGC typically uses specialized transition investment managers when transitioning large pools of assets to keep explicit costs down through economies of scale and by taking advantage of other services offered by these managers.[28] However, opportunity costs can vary widely based on market conditions, and can result in either a net

[24]This interim policy was a product of a series of specific staff inquiries about how to go about transitioning assets until the board adopted a new investment policy statement.

[25]For a diagram of the transitioning of funds to align with PBGC's investment policy, see appendix II.

[26]Because transaction costs vary based on the volume and type of assets acquired from newly terminated plans, as well as market conditions, it was not possible to isolate the costs attributable to implementation of a specific investment policy apart from these other factors.

[27]We use this broad definition of transaction costs in this report. One could also define transaction costs more narrowly to refer just to the explicit costs of the trade.

[28]For example, transition managers can provide lower transaction costs by "crossing"—that is, moving—securities from one client's account to another client's account without incurring costs in the open market.

loss or a net gain. Taking both explicit and implicit costs together, when transactions net an amount lower than the original value of the assets, a loss occurs; when transactions net an amount greater than the original value of the assets, a gain occurs. Although PBGC does not routinely track and conduct analytics on the transaction costs associated with implementing different investment policies, we were able to compile the costs incurred during each period a policy was in place from 2004 forward by obtaining records from PBGC officials as well as PBGC's external transition managers, as summarized in table 2.

Table 2: Transaction Costs Incurred with Investment Policies Adopted in 2004, 2006, and 2008

	2004 policy	2006 policy	2008 policy
Investment goal	**Reduce equity investments to 15–25%**	**Maintain equity investments at 15–25%**	**Increase equity to 45% and certain subclasses of fixed-income investments**
Date policy established	January 29, 2004	February 14, 2006	February 12, 2008
New York Stock Exchange Composite Index[a]	+25.9%	+12.5%	-35.3%[b]
Volume of assets transitioned	$8.8 billion	$2.6 billion	$13 billion
Transaction costs[c,e]			
Explicit costs (fees, commissions, and certain taxes)	$2.2 million	$2.9 million	$5.7 million
Implicit costs (due to market changes during transactions)[d]	$42.7 million (gain)	$4.7 million	$68.9 million
Total net transaction costs	**$40.5 million (gain)**	**$7.6 million**	**$74.6 million**

Sources: GAO analysis of data from PBGC, BlackRock, and State Street.

[a]New York Stock Exchange Composite Index serves as an indicator of how the market was performing.

[b]Return shown is for the period from February 2008 through May 2009.

[c]Transaction costs primarily reflect the costs associated with trading equities rather than fixed-income securities. Transaction costs related to fixed-income trades were not tracked during implementation of the 2004 and 2006 policies, and for the initial implementation (between November 2008 and January 2009) of the 2008 policy. PBGC provided costs related to fixed-income trades during implementation of later phases of the 2008 policy, but did not provide a breakdown of explicit and implicit costs. These costs, totaling $17.2 million, are included in implicit costs.

[d]Implicit costs include what is referred to as the "implementation shortfall" and time to reach the new allocation, which is generally captured in the "spread costs"—that is, the cost between the bid (sell price) and the ask (buy price).

[e]Transaction costs during implementation of the 2008 policy reflect the costs associated with asset trades of about $9.3 billion that were tracked during the last two phases of the transition. Transaction costs associated with asset trades of about $3.7 billion, made during the first phase of the transition, were not tracked.

From 2004 to 2008, PBGC's investment policy remained primarily the same: to transition assets from newly terminated plans to increase the level of fixed-income investments. When the 2004 policy was being implemented, assets valued at $8.8 billion were transitioned, and positive market conditions helped PBGC realize a net gain of $40.5 million (or 46 basis points).[29] When the 2006 policy was being implemented, assets of about $2.6 billion were transitioned, but declining market conditions towards the end of this period contributed to a loss of $7.6 million (or 30 basis points).

In 2008, PBGC's investment policy shifted to increasing the level of equity investments and certain subclasses of fixed-income securities and the agency opted to use assets already in the trust fund, as well as newly terminated plan assets, to accelerate implementation of the policy.[30] In total, assets of about $13 billion were transitioned while this investment policy was in place, with $5.4 billion moving from fixed-income securities to equities and $7.6 billion moving from one type of fixed-income securities to others (specifically, from long-duration securities to high-yield and emerging market debt). These transactions were completed in three phases. According to PBGC's own records, phase one was performed in an "ad hoc" manner and transaction costs were not tracked. Assets transitioned during this phase totaled approximately $3.7 billion. Phase two was more structured (referred to as "coordinated sales"), with PBGC assigning each fixed-income investment manager an amount of trust fund assets to sell over a 5-month period, allowing trades to be made on favorable trading days at the discretion of the investment manager. About $7.9 billion in assets were transitioned during this phase. During phase three, termed the "runoff" phase, the 2008 policy had been suspended, but PBGC officials told us they decided not to cancel the trades for about $1.4 billion in assets that their investment managers already had initiated. Due in part to the market downturn during the period the 2008 policy was in place, the transaction costs associated with asset trades of about $9.3 billion that were tracked during the last two phases of the transition totaled nearly $74.6 million (or 80 basis points). According to one PBGC investment manager, some trades related to the 2008 transition incurred opportunity costs of 400 to 500 basis points.

[29]The costs or gains associated with financial transactions are often expressed in terms of basis points, with each basis point equal to 1/100th of 1 percent.

[30]In the course of implementing the 2008 policy, PBGC hired a consultant for additional work at a cost of $600,000.

In July 2009, a new interim directive was issued to decrease the level of equity investments back to the asset distribution held as of March 31, 2009. PBGC staff estimated that implementing this new policy could incur transaction costs of as much as $52 million. In January 2011, PBGC provided data indicating that between June 2009 and September 2010, $7.4 million in transaction costs had accrued since implementation of this 2009 directive.

PBGC's Investment Performance Results Have Been Mixed

Our analysis of PBGC's investment performance found that PBGC's investments performed better than most on an asset-only basis compared with the seven benchmark portfolios (see table 3). However, PBGC's investment portfolio tended to underperform these benchmarks when returns were assessed together with the liability return (or growth in liabilities). Specifically, in the asset-only comparison, PBGC's portfolio achieved better risk-adjusted performance on its investments than that achieved by six of the seven benchmark portfolios. When assessed with liabilities, however, all seven benchmark portfolios performed better than PBGC's investment portfolio. This occurred for either one of two reasons: either the benchmark had a mix of assets that were better correlated (that is, moved more in tandem) with PBGC's liability return (growth in liability), or, when this was not the case, the benchmarks had returns sufficient to compensate for the lower correlations for the period examined. The best performing benchmark (the Pension Protection Act benchmark) incorporated elements of both features, with a mix of relatively high returns on assets and relatively high correlation of their assets with PBGC's liabilities.

Our analysis looks at the single historical period from 1976 to 2009, since the purpose of the analysis is performance assessment, not asset allocation recommendations. Typically, analyses for the purpose of asset allocation would project forward over multiple potential future economic scenarios in order to more fully assess potential risk and reward. The various alternative static portfolios used in this report were analyzed for the purpose of a "what-if" analysis—a historical comparison of alternative investment strategies versus the fluctuating asset allocation that PBGC actually employed—they were not for the purpose of recommending a particular asset allocation going forward. Further, the fact that a particular portfolio performed well over the 1976 to 2009 period in this particular analysis does not necessarily mean that such a portfolio would be appropriate for PBGC going forward.

Table 3: Descriptions of the Seven Benchmark Portfolios in GAO's Analysis

Benchmark	Asset class composition
Equity investment benchmarks[a]	
S&P 500	• 100% equities. • This is a static composition portfolio representing the equity asset class.
Wilshire 5000	• 100% equities. • This is a static composition portfolio representing the equity asset class with a greater allocation to smaller capitalization stocks than the S&P 500.
Fixed-income investment benchmark	
Barclays Capital Long-Term Government Credit Index	• 100% fixed income. • This is a static composition portfolio representing the fixed-income asset class, including both corporate and U.S. government fixed-income asset classes.
Mixed equity and fixed-income investment benchmarks	
Pension Protection Act Benchmark[b]	• 60% equities, 40% fixed income. • This is a static composition portfolio.
Life Insurance Benchmark	• 85% fixed income, 15% equities. • This is a static composition portfolio, and is intended as a stylized representation of the asset portfolio typically held by life insurance firms in their general accounts.
Post Fiscal Year 2002 Benchmark	• 30% equities, 60% fixed income, and 10% riskless short maturity fixed-income securities ("cash"). • This is a static composition portfolio, and is intended as a stylized representation of the average asset allocation of the PBGC Total Fund from November 2001 through December 2009.[b]
Dynamic Benchmark	• Equivalent to the asset class composition for the PBGC Total Fund. • This is a dynamic composition portfolio whose asset allocation varies over time in concert with the PBGC total fund for several broad asset classes: domestic equity, international equity, fixed income, and cash.

Source: GAO.

Note: For more detailed discussion of these benchmark portfolios, see appendix III.

[a]While equity portfolios are included for analytical purposes, PBGC can not invest in 100 percent equities because ERISA requires that certain portion of its assets is restricted to investing some revolving funds in U.S. obligations which are fixed-income assets. Other revolving funds may be invested as PBGC considers appropriate, but current policy is to invest them in U.S. Treasury securities. 29 U.S.C. § 1305(b)(3) and (f)(3).

[b]The Pension Protection Act of 2006 requires PBGC to compare the performance of its investments to a hypothetical portfolio referred to in this report as the PPA benchmark. Pub. L. No. 109-280, § 412, 120 Stat. 780, 936

We assessed performance by calculating risk-adjusted returns for PBGC's portfolio and for each benchmark, where higher returns improve performance while higher volatility reduces performance.[31] The comparative benchmarks used for this analysis represent a range of equity and fixed-income allocations. Six of the benchmarks are largely static (fixed) allocations among asset classes; however, we also included one Dynamic Benchmark that had allocations that varied among asset classes over time.

PBGC's Investments Outperformed Benchmark Portfolios on an Asset-Only Basis

Our analysis of PBGC's investment returns for the period 1976 to December 2009 found that, on an asset-only basis, PBGC's portfolio achieved better risk-adjusted performance on its investments than that achieved by six of the seven benchmark portfolios.[32] Specifically, our analysis found that on an asset-only basis, PBGC's portfolio outperformed five of six fixed-allocation benchmarks,[33] as well as the Dynamic Benchmark. In each instance, the results were maintained regardless of whether or not PBGC investment returns were net of investment expenses.[34] Within this framework, the PBGC and benchmark portfolios

[31]In a prior report we noted that when PBGC took an asset-only approach to guide its new investment policy, an analysis that incorporates assets, liabilities, and the funded position should have also been conducted. See GAO, *PBGC Assets: Implementation of New Investment Policy Will Need Stronger Board Oversight*, GAO-08-667 (Washington, D.C.: July 17, 2008).

[32]PBGC's portfolio for this analysis includes PBGC's investments in both the trust fund and the revolving fund combined.

[33]The exception was the Post Fiscal Year 2002 Benchmark portfolio; however, this fixed allocation portfolio is also based upon the PBGC total fund since the portfolio weights reflect the PBGC's investment portfolio from November 2001 to December 2009.

[34]The primary driver of the total fund's performance lies in the lower volatility of the returns, overall—that is, the returns provided lower downside risks or fewer extreme negative returns.

were evaluated solely on how well the assets performed relative to the risks taken.[35] For details see appendix III.

PBGC Investments Underperformed Relative to Benchmark Portfolios When Returns Were Assessed with the Liability Return

When consideration of changes in liabilities was included in our analysis, we found that PBGC's investments did not perform as well as the seven benchmark portfolios.[36] PBGC must cover the liabilities from the underfunded plans it trustees in order to pay benefits to participants and beneficiaries. Other than the premiums assessed on plan sponsors that are statutorily set,[37] the only revenue that PBGC has to cover its liabilities is the return on the assets it manages. Given this context, analyzing PBGC's investment performance in a framework that explicitly incorporates liabilities provides useful information.

We found that PBGC's investments underperformed all seven of the benchmark portfolios on a risk-adjusted basis when the returns were analyzed net of the liability return.[38] In simple terms, this means that all

[35]29 U.S.C. § 1306. While these analyses have limitations and may offer an incomplete picture of PBGC's overall performance, asset-only and asset-net of liability analyses represent a traditional approach to evaluating PBGC's investment performance. Although there are different ways of incorporating liabilities into asset allocation strategies, our asset-net of liability analysis excludes external cash flows in a manner consistent with other practitioners. However, this ignores both PBGC's inability to adjust premium rates by judging it within a framework that assumes this flexibility. Furthermore, if new terminations were included in the measure of liabilities the correlation between stock market returns and liability returns would likely be lower or even negative, resulting in lower risk adjusted performance for portfolios with a heavier weighting toward stock. In the approaches we reviewed, practitioners and others have incorporated liabilities by including only the existing stock of liabilities when calculating liability returns rather than including external cash-flows of liabilities coming into the fund. It should be noted that PBGC's current approach of calculating the liability growth uses PBGC's existing stock of liabilities and not incoming cash-flows from new plan terminations taken in by PBGC. Given this precedent, we have followed this approach but acknowledge that an alternative approach including external cash flows may be more appropriate for evaluating PBGC's portfolio. External cash-flows would consist of assets and liabilities received from terminated plans coming in to the PBGC. For additional information, please refer to appendix III.

[36]While an analysis that focuses solely on investment returns provides some useful information on PBGC's portfolio performance, our explicit inclusion of the PBGC's liabilities is consistent with the type of analysis we noted was necessary in a prior report. GAO-08-667.

[37]29 U.S.C. § 1306.

[38]We use an adjusted Sharpe ratio to correct for the excess returns net of liabilities for PBGC and the comparison benchmarks being negative.

seven of the constructed benchmarks had a mix of assets with some combination of risk, return, and correlation levels that made their investment strategies achieve a higher level of risk-adjusted performance than PBGC's investment policy for the 1976 to 2009 period. This occurred because either the benchmark portfolio had a mix of assets that had a higher correlation with the liability return, or, in cases where the correlations were lower, the benchmark portfolio had sufficient returns to compensate for the lower correlations for the period we examined. However, the dynamic portfolio, which maintains the same asset allocation as the PBGC total fund, performed as well as the S&P 500 benchmark and out performed the Barclays Capital and Post Fiscal Year 2002 benchmarks as well as the PBGC portfolio—three portfolios that have significant allocations to bonds. (For additional information, see app. III).

According to our analysis, the best performing portfolio for the 1976 to 2009 period was the PPA Benchmark Portfolio, with a mix of 40 percent bonds and 60 percent equities.[39] Because, this analysis is strictly based on past performance, this result does not guarantee or imply that a PPA-like portfolio will perform better than the current PBGC allocation going forward. Moreover, the PPA benchmark and other portfolios with a significant weighting toward equity would likely not perform as well if incoming cash-flows from new plan terminations were included in the analysis. Rather than determining a particular asset allocation, this analysis highlights that an approach that was not only mindful of returns, but also accounted for the correlation between asset returns and the liability return, was more likely to result in an investment policy for PBGC

[39]PBGC's portfolio of assets has a higher allocation to bonds and a higher correlation with the liability growth than the PPA portfolio, but PPA's higher returns and relatively high correlation with the liability growth resulted in better risk-adjusted performance overall.

that achieved higher risk-adjusted performance for the 1976 to 2009 period.[40]

No Clear Evidence that Fluctuation in the Allocation of Investments Had Adverse Effect on Performance

Our analysis found no link between the frequent changes in PBGC's investment policy since 1990 and the actual allocation between equity and fixed-asset investments. This is because while the stated policy shifts were significant, changes to the actual allocation were moderate. Hence, changes remained within a narrow range of a portfolio mix between fixed-income and equity allocations. As a result, although some shifts in actual allocations did occur, we found no conclusive evidence that fluctuations in the proportional allocation between equity and fixed-income investments had a notable adverse impact on PBGC returns. This was the case for both types of analysis—asset-only and assets net the liability return.

Finally, in the assets net of liability context, our finding that PBGC's portfolio underperformed relative to the Dynamic Benchmark suggests that factors other than asset allocation are causing the underperformance—such factors could include the inflows of new assets, timing of shifts to meet allocation goals and their associated costs, or could reflect that there are no costs or fees in the Dynamic Benchmark. However, detailed information would be required to determine the reasons for the underperformance of the PBGC total fund relative to the Dynamic Benchmark.

[40]These results also differed significantly from those discussed earlier in the asset-only context. As we pointed out in our previous report (GAO-08-667), our concern with 2008 investment policy was that it did not explicitly consider the PBGC's liabilities and may have understated the risk inherent in a portfolio tilted toward equity and alternative assets. In other words, the policy did not make it clear that by striving for greater returns, PBGC would be sacrificing lower risk and higher correlation with liabilities. Due to certain limitations, these results should be interpreted with caution, especially given the manner in which we incorporated liabilities into the measures of risk-adjusted performance (see app. III). Ideally, a complete analysis of PBGC's assets net of liabilities would include both its existing stock of liabilities, its incoming cash flows from newly terminated plans and complete information regarding transitions, and transaction costs in order to fully assess PBGC's past performance and make a thorough assessment of future investment allocations for long-term asset management. A complete approach would also accurately reflect PBGC's ability, or inability, to set appropriate premiums covering risk.

PBGC's Policies and Procedures for Implementing Its Investment Policy Are Incomplete

In our review of PBGC's internal documents, we found that the agency has largely functioned without complete investment policy statements and operating procedures. Compared to industry-recommended standards for pension funds and insurance companies, PBGC's investment policy statements are missing important provisions that provide implementation guidance. Further, PBGC staff have largely functioned without the benefit of fully developed and documented operating procedures.

Investment Policy Statements Generally Lack Specifics in Key Areas

The investment policies issued by PBGC's board for strategic guidance in the planning and execution of investments have generally lacked a number of provisions recommended for sound investment management or have been insufficiently detailed to provide adequate guidance for staff concerning certain investment objectives.

One expert we interviewed stated that while PBGC is unique and may not be obligated to articulate the same policy provisions as other institutions with similar responsibilities—such as foreign pension insurers, domestic pension funds, and private insurance companies—the agency faces similar investment problems, opportunities, and solutions as many investment programs do. Hence, it is equally important for PBGC to have a well-developed investment policy statement as it is for these other institutions. According to one expert, "an investment policy statement (IPS) is a foundational document for a pension fund's investment program. The essential purposes of the IPS are to articulate the consensus view of the board regarding the overall investment program and to document policies and procedures regarding major issues."[41]

However, we found items included in the PBGC's policy statements often are insufficiently detailed to provide adequate guidance for staff concerning certain investment objectives. For example, we found that prior to 1990, PBGC operated without a formal investment policy statement, and that the six different policy statements the PBGC board has issued since then have been silent in many areas cited as important by professional organizations such as the Chartered Financial Analyst Institute, the Association of Public Pension Fund Auditors, and the Foundation for Fiduciary Studies. We compiled a list of 25 items these

[41]S.W. Halpern, *Governance of Public Pension Assets*, paper presented at the World Bank's Symposium on Public Pension Governance and Investment Conference, (Indonesia, June 2009).

organizations recommended be included in an investment policy statement in order to provide sound strategic guidance across the key areas of governance, investment objectives, and risk management.[42] We then examined PBGC's policy statements against these items and found certain items were often missing (see table 4). The agency's 2008 policy statement has been the most thorough to date (including 15 of the items) while PBGC's most recent investment guidance, adopted by board representatives in 2009, included the fewest to date (only 6 of the items).[43] Further, some of the provisions that were covered were, according to some staff, insufficiently detailed to offer adequate guidance.

Table 4: A Comparison of PBGC Investment Policy Statements with Best Practices

	Years					
Policy	**1990–1994**	**1994–2004**	**2004–2006**	**2006–2008**	**2008–2009**	**2009–2010[a]**
Governance						
1. Defines the organizational structure and mission	✓	✓	✓	✓	✓	
2. Specifies responsibilities for determining, executing, and monitoring the investment policy	✓	✓	✓	✓	✓	
3. Describes investment policy review			✓	✓	✓	
4. Describes responsibility for hiring, firing, and monitoring managers	✓	✓	✓	✓	✓	
5. Describes board and staff roles	✓	✓	✓	✓	✓	
6. Assigns responsibility for asset allocation						
7. Assigns responsibility for risk management, monitoring and reporting						
8. Describes fiduciary responsibilities						
Investment objectives						
9. Describes investment objective	✓	✓	✓	✓	✓	
10. States return/risk requirements						
• States performance objective (rate of return)						
• Describes asset class investment guidelines (including allowable and prohibited investments)						

[42]We included items identified by at least two of the three bodies as important.

[43]The PBGC has operated without a formal investment policy statement since June 2009.

Policy	Years					
	1990–1994	1994–2004	2004–2006	2006–2008	2008–2009	2009–2010[a]
• Describes an asset allocation policy (targets and ranges)	✓	✓	✓	✓	✓	✓
11. Defines risk tolerance						
12. Identifies liabilities						
13. Identifies relevant constraints						
• Defines evaluation horizon						
• Identifies liquidity requirements					✓	
• Specifies leverage policy	✓	✓	✓	✓	✓	
• Identifies other constraints	✓	✓	✓	✓	✓	✓
14. Describes other considerations						
• Identifies proxy-voting policy	✓	✓	✓	✓	✓	
• Identifies securities lending policy	✓	✓	✓	✓	✓	
• Identifies special factors (such as ESG)						
Risk management and monitoring						
15. Establishes performance measurement and reporting	✓	✓	✓	✓		✓
• Defines rebalancing process					✓	✓
• Describes investment cost monitoring	✓	✓	✓	✓	✓	✓
• Describes transition policy	✓	✓	✓	✓		

Sources: PBGC, Chartered Financial Analyst Institute, Association of Public Pension Fund Auditors, and Foundation for Fiduciary Studies.

Notes:

1. Policy items mentioned in the investment policy statement—but not detailed—are marked with a "✓".

2. Policy items not mentioned in the investment policy—where no policy exists—are left blank.

[a]The interim policy under which PBGC operated during the period was a product of a series of specific staff inquiries about how to go about transitioning assets until the board adopted a new investment policy statement consistent with its bylaws. A new investment policy statement was adopted by the board in May 2011

Governance

In the governance area, PBGC's investment policy statements have not assigned responsibility for managing, monitoring, and reporting on portfolio risk. According to PBGC officials, those responsibilities were either informally communicated to staff or staff assumed responsibility for these activities on their own. Further, while most of PBGC's statements include a discussion of hiring and monitoring asset managers, they do not assign responsibility for these tasks to a specific group. By contrast, the investment policy statement of the United Kingdom's pension insurer, Pension Protection Fund, and most of the public pension plans that we reviewed do assign responsibility for these tasks to specific groups, such

as the public plan's investment advisory committee. Also, while PBGC's investment policy statements assign responsibility for the execution of the investment program, they generally do not assign responsibility for developing or monitoring the implementation of the policy.

According to statute, the PBGC board is responsible for establishing policy.[44] In addition, the board has an oversight responsibility to ensure that PBGC is executing the board's policy in appropriate ways. According to PBGC staff, because of the lack of specific guidance in the policy statements, there have been instances when staff have had to request further policy guidance from PBGC's board and the board had not always been responsive. For example, in 2004, the board had instructed staff to limit costs by using only incoming assets to transition to the new allocation target. When adherence to this directive, together with a low level of liquid, incoming assets caused the agency to miss its new allocation targets, staff told us they asked for guidance but did not receive it. More recently, in May and June 2009, the board members issued a resolution directing staff to cease implementation of the 2008 investment policy, but did not approve a new investment policy statement and did not provide further investment guidance. In response, PBGC's Corporate Investments Department's (CID) staff wrote a memo to PBGC's acting director indicating that they were concerned about the lack of a defined policy to provide direction to CID staff with respect to asset allocation. Principal areas of concern outlined were: (1) oversight and management, (2) investment of newly trusteed assets, and (3) asset allocation risk. Subsequently, policy guidance was provided by the board representatives until a new investment policy statement was approved by the board.[45]

In addition, while we have found that the board and board representatives are meeting more frequently than in the past, we could find no formal oversight or formal feedback mechanism in place for the board and board

[44]29 U.S.C. § 1302(f). A presidentially appointed, Senate-confirmed director is responsible for administering the agency. 29 U.S.C. § 1302(a). Thus, the board approves policy which then the director implements. Further, in order to execute the policy, the agency must develop program guidance and implementing procedures. The guidance and procedures would include designations of accountability for action and reporting results, appropriate performance measures, and requirements to document actions and oversight, thus enabling staff to apply the policy consistently.

[45]According to PBGC's by-laws, board representatives may approve the investment policy statement as long as the policy is ratified in writing by board members. 29 C.F.R. § 4002.3(b)(2) (2011). From June 2009 to present, the board had not ratified a new investment policy statement.

representatives—a mechanism that is a necessary element for ensuring that PBGC is executing the policy in appropriate ways. According to one expert we interviewed, the inventory of critical subjects regarding an investment program is extensive, and the board is ultimately responsible for assessing and overseeing all of them.[46] Some of the key elements the expert noted that should require the board's focus include clearly articulated governance policies; a comprehensive, written investment policy statement; a well thought out asset allocation process;[47] clearly defined and appropriate measures; monitoring processes; and monitoring of investment costs.[48] Although PBGC staff told us that these things were accomplished below the level of the board members, we could find no documentation that indicated that such a formal oversight mechanism was in place. We reviewed decades of board meeting notes—up through the most recent meetings—in search of such evidence, but could find none.

Investment Objectives

In the area of investment objectives, PBGC's statements have remained silent with respect to several items, such as return targets and statements of risk tolerance. By comparison, the United Kingdom's Pension Protection Fund board, in its policy statement, has specifically set a long-term target investment return of 1.8 percent above liabilities and a risk level equivalent to a tracking error of 4 percent against liabilities. The Pension Protection Fund also identified nine risks that might affect its investments and identified approaches to mitigate those risks. Six of the eight public pension plans we reviewed also included a return target and a risk tolerance in their investment policies. One expert stressed, in particular, the importance of documenting tolerance for risk in the investment policy cautioning that without such documentation, a firm risks making changes at a bad time (selling at a deep discount) or in response to political pressure. In order to keep the investment policy out of the political realm, a well-documented, long-term, and disciplined view with an effective governing board is necessary, while following a well established allocation model that keeps long term perspective in mind.

[46]Halpern, *Governance of Public Pension Assets*.

[47]Processes for asset allocation include which methodologies are utilized, on what data and capital markets assumptions those methodologies are based, in light of what factors those methodologies are chosen (for example, the relationship between assets and liabilities, the need for cash flow and liquidity, and the investment horizon), and what procedures are in place for periodically rebalancing the portfolio.

[48]Halpern, *Governance of Public Pension Assets*.

Risk Management

In the area of risk management, although most items were covered in PBGC's policy statements, almost all lacked sufficient detail to provide adequate guidance. For example, the cost management provision of PBGC's statements generally identified the types of investment expenses involved and offered a low-cost policy for investing, but did not provide guidance on how to monitor these costs. As noted by some experts, ultimately, investing is not about seeking returns but about managing risks, with well-grounded policies to ensure adequate monitoring of risks over time.

Typically missing from PBGC's investment policy statements has been the practice of portfolio rebalancing. A provision for rebalancing was provided for the first time in 2008. All of the public pension plans that we studied included such tolerance ranges. Most also specified a time frame for rebalancing or assigned responsibility for determining a course of action.

PBGC's Staff Has Functioned without Formal Operating Procedures

The PBGC's CID staff has largely operated without fully developed and documented operating procedures, although it has recently begun to create them. According to a PBGC staff member, the mission of the CID is twofold: (1) to transition newly trusteed assets into PBGC's investment portfolio and (2) to manage PBGC assets. Further, to transition newly trusteed assets into PBGC's investment portfolio, CID staff are responsible for transferring assets so that they are commingled in compliance with PBGC policies, and are consistent with PBGC's asset allocation. However, the staff member also said that PBGC historically has not had formal procedures for executing the investment policy and transitioning assets. As a result, according to PBGC's Inspector General, when the former board established the 2008 investment policy, certain tasks were not performed in the proper order by CID staff. For example, according to PBGC's Inspector General, PBGC had actually undergone several transition related activities—such as the selection of three investment management firms for strategic partnership contracts for managing $2.5 billion in PBGC assets—before risks and mitigating methods related to the transition were even documented. In addition, CID staff provided a group of documents covering a number of transition related activities that had several notable weaknesses. For example, these documents indicated timelines for implementation, but provided no risk analysis, accountability measures to monitor progress, or a delineation of roles and corresponding responsibilities related to the transition.

According to a PBGC staff member, to manage PBGC's assets, at a high level, CID staff are responsible for five operational tasks: (1) select, hire, and terminate investment managers; (2) oversee managers: (3) oversee the aggregate investment program: (4) implement board asset allocation and any other board investment policy; and (5) oversee all aspects of the PBGC investment programs including cash management and securities lending. In 2010, CID staff began to draft more complete working procedures for their investment operations, however, PBGC's CID staff and the Inspector General recently told us that this effort has been a slow undertaking. PBGC's CID staff stated that creating procedures takes away from their ability to do their mission work and, thus far, they have only been able to provide preliminary and incomplete drafts of some of the needed procedures. However, while complete operational procedures are lacking for most of the operational tasks under the purview of the CID, PBGC's CID staff have recently completed a draft compendium of formal procedures that detail processes and procedures for managing their securities lending program—the smallest program operated within the CID.[49]

According to one expert, well functioning operational policies and procedures are an essential mechanism for ensuring linkages between a fund's governance structure, which includes policy making, and its management systems. This expert wrote that with regard to operational policies, directors should (1) identify and address aspects of the fund's investment operations, organization, and portfolio necessary to control undue risk and expenses, minimize inefficiency, and achieve the desired long-term return; (2) evaluate the fund's organization and procedures relative to those of its peers and industry best practices; and (3) find ways to enhance public trust and confidence in the pension insurance system. The board must oversee and approve such policies and procedures.[50]

[49]These procedures are still in draft form. Until the board, through the board representatives, reviews and comments on these procedures they will not be final. Additionally, though CID staff may believe the procedures are complete, PBGC has not formally submitted the procedures to the board for its consideration.

[50]Halpern, *Governance of Public Pension Assets*.

Conclusions

PBGC has grown from a relatively small agency with about $34 million in assets in its first year after its establishment in 1974, to one with almost $80 billion in assets in fiscal year 2010. As the agency has grown, so too has the frequency of changes to its investment policies. The agency's policies and procedures for asset management still reflect its small agency past. Indeed, there are few formally documented procedures and the investment policy statements are insufficiently detailed for the agency to manage its investments and apply the investment policy consistently during a transition period and during times of political change. Without a detailed investment policy and formal investment procedures, the agency operates in an environment that is ripe for costly transactions and sub-par returns. When factoring in the frequent changes to the investment policy with the incomplete policies and procedures, a picture emerges that suggests PBGC lacks a disciplined approach to investing—an unsettling picture of an agency with responsibility for a large asset portfolio and a challenging financial future.

As the guarantor of basic pension benefits for 44 million Americans, PBGC must take a more disciplined and long-term approach to investment by developing and adhering to a long-term comprehensive investment policy and developing a complete compendium of operational policies and procedures. Well-functioning operational policies and procedures are an essential mechanism for ensuring linkages between pension funds' governance structure and management systems. Current work under way by PBGC's CID staff to develop such policies and procedure is an important first step, but greater commitment is needed from both the PBGC board and its management to assure that PBGC can effectively and consistently meet its obligation to conduct the many investment related functions it performs.

Recommendations for Executive Action

We are making the following two recommendations:

1. To ensure a disciplined and long-term approach to investment, we recommend PBGC and its board of directors develop and maintain a comprehensive investment policy statement that provides clear organizational accountability, well-defined goals, and risk management parameters.

2. To ensure proper stewardship of PBGC's assets and effective implementation of its investment policy, we recommend that PBGC develop a complete set of operating procedures and guidelines consistent with recognized best practices in industry and government.

Agency Comments and Our Evaluation

We obtained written comments on a draft of this report from PBGC and from the Department of Labor (Labor), which are reproduced in appendixes IV and V, respectively. PBGC and Labor also provided technical comments, which we incorporated into the report as appropriate.

PBGC and Labor generally concurred with our recommendations and outlined actions the agency has taken to address many of the concerns we raised. For example, PBGC and its board recently issued a more comprehensive investment policy statement that has incorporated many of the policy items that we identified as missing from previously issued policy statements. In addition, PBGC is in the process of developing a complete set of operating procedures and guidelines. We are pleased to learn of the steps already taken and those underway to address our recommendations. In our view, these initial actions and continued efforts to implement our recommendations fully can only strengthen the stewardship of PBGC's investments to better assure that PBGC can effectively and consistently meet its obligation to conduct the many investment-related functions it performs.

Underscoring its concern with the importance of PBGC's mission, Labor highlighted the increased oversight activity by the current board, its representatives and their staffs. The Secretary noted that the board also exercises its oversight responsibilities through monthly transition and investment reports written documentation and other activities. We acknowledge this increased oversight and appreciate the efforts by the current board to play a greater role in monitoring the PBGC. The increased oversight by the current board members and their representatives indeed represents an improvement in the way policies and processes are adopted and overseen at the PBGC, but we believe such improvements must be documented and institutionalized to assure that such levels of effort are sustained through subsequent boards. Our prior recommendations to Congress to improve governance at the PBGC through an expanded and restructured board continue to be needed to assure that such appropriate and continuous oversight is carried out, not only today but in the future.

As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies of the report to the Secretary of Labor, the Director of the PBGC, and other interested parties. We will also make copies available to others on request. This report is also available at no charge on the GAO Web site at http://www.gao.gov.

If you or your staff have any questions regarding this report, please contact Barbara Bovbjerg at (202) 525-7215 or bovbergb@gao.gov. Contact points for our Congressional Relations and Office of Public Affairs can be found on the last page of this report. Key contributors are listed in appendix VI.

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Appendix I: Scope and Methodology

To determine how Pension Benefit Guaranty Corporation's (PBGC) investment objectives have changed over time and whether policy goals have been met, we collected and reviewed investment policies used by PBGC from 1990 through the policy dated October 2009. We started our review with PBGC's 1990 investment policy because it was the first investment policy that specified asset allocation targets, such as the proportion of assets to be invested in fixed-income assets versus equities. For each of these policies, we identified the overall objective, such as whether the policy attempted to maximize earnings using a higher proportion of equities or reduce risk by increasing the proportion of fixed-income securities matched to the duration of their liabilities. We also identified the percentages of each type of asset required by the policy, such as the percentage allocated to equities versus fixed-income investments, and compared these target allocations to actual allocations as stated in PBGC's annual reports, internal trust and revolving fund data, and other financial information received from PBGC officials. We then looked at the conditions leading up to each change in policy, such as changes in investment philosophy, incoming assets from terminated plans, and changes in leadership at the executive director level. We obtained this information through interviews with PBGC officials, and from other information provided by the agency, including internal memos, e-mails, inspector general audit reports, summary information prepared for board and advisory committee members, asset and liability studies, and other reports and memos prepared by various PBGC investment managers and consultants. We also performed a detailed review of PBGC board and advisory committee meeting minutes using NVivo content analysis software. To identify and summarize discussions related to investment policy development, review, and implementation, we reviewed investment policy statements, related investment advisory committee meeting notes and documentation, and board meeting notes when available. We obtained and reviewed this information from PBGC's inception in 1974 through the current policy, but focused our analysis on the period between 1990 and the 2009 policy because the policies in place during that period were the focus of our review.

We also interviewed past PBGC directors, board representatives, advisory committee members, and the PBGC Inspector General. We also reviewed relevant federal laws and regulations. To determine how PBGC's changes in investment policy compared to other entities, we interviewed officials from several pension consultants, investment and transition managers, life and property and casualty insurers, and large state pension plans. We also interviewed and reviewed investment policy-related information provided by foreign pension insurers in Canada, the Netherlands, Switzerland, and

the United Kingdom. However, we did not conduct an independent legal analysis to verify the information provided by state pension plans or foreign pension insurers. Finally, we reviewed past our work on PBGC's investment policies and oversight structure.

To determine how PBGC transitions assets between investment policies and the resulting costs, we interviewed PBGC officials responsible for transitioning assets and reviewed transition related documentation provided by PBGC officials, as available. For transitions where data was not available from PBGC, we obtained this information directly from PBGC's transition managers and interviewed officials from those firms to determine both implicit and explicit transaction costs associated with changing investment policies. We also looked at the procedures and costs associated with transitioning assets from terminated plans taken over by PBGC to determine whether or not it was possible to separate these costs from costs associated with changing policies.

We interviewed the PBGC Inspector General and past PBGC directors to obtain additional information about PBGC's transition related policies and other adopted practices. In order to understand asset transitions more generally, we interviewed transition and investment managers, financial industry consultants, and officials at several large state pension plans. We also looked at market conditions and returns on equity and fixed-income investments during the periods in which PBGC was transitioning assets. We limited our analysis of transaction costs to the policies in place from 2004 through 2009 because of the lack of detailed cost data available from PBGC and their transition managers for transactions made prior to the 2004 policy.[1]

To assess the performance of PBGC's investments, we conducted a portfolio performance evaluation of the agency's Single-Employer Total Fund monthly returns from the period October 1976 to December 2009. This analysis focused on the single-employer program, which accounted for 96 percent—or $21.08 billion—of the $21.95 billion total deficit from the single-employer and multiemployer programs, as of September 30, 2009.[2] For those portions of this analysis involving PBGC liabilities, we

[1]According to PBGC, one of PBGC's transition managers only retains records for 7 years.

[2]Given the emphasis on the PBGC Single-Employer Total Fund in our analysis, the phrase "PBGC Total Fund portfolio" will be used for brevity for the remainder of this section and should be understood to refer to the Single-Employer Total Fund at PBGC.

used data on the liabilities associated with (terminated) trusteed plans within the single-employer program.[3] The Single-Employer Total Fund represents the pool of trusteed assets that supports the liabilities associated with terminated defined benefit plans that have been trusteed by PBGC.

As part of the portfolio performance evaluation, we compared PBGC's Total Fund portfolio return performance to the returns on several well-diversified benchmark portfolios via a number of portfolio performance statistics. We selected well-diversified benchmark portfolios for the portfolio performance evaluation to ensure that the variability of the benchmark portfolio returns almost exclusively represented systematic risk and not the idiosyncratic risk associated with individual securities. Also, the portfolios were selected such that they represented exposure to the systematic risks that are reflected in the returns on several specific, broad asset classes. The asset classes are the domestic equity asset class (United States), the foreign equity asset class, the short maturity, risk-free asset class, and the long maturity fixed-income asset class. These particular asset classes were chosen because they are the ones emphasized in asset allocation data provided by PBGC.[4] The benchmark portfolios used in this analysis are also distinguished by whether their asset class composition varies dynamically over time ("dynamic" composition portfolios) or is constant over time ("static" compositions portfolios). The benchmark portfolios and their characteristics are as follows:

- *S&P 500*. Asset class composition: 100 percent equities. This is a static composition portfolio that represents the equity asset class.

[3]Our analysis includes only liabilities from trusteed defined benefit plans (instead of all terminated plans, both trusteed and pending trusteeship by PBGC) because, according to PBGC, it is ultimately liable only for the trusteed plans—not all terminated plans.

[4]For the remainder of this section, the domestic equity class as "domestic equities"; the international equity class as "international equities"; the domestic and international equity classes combined as "equities"; the fixed-income asset class as either "bonds" or "fixed income"; and the short maturity fixed-income sector that is free of systematic and credit risk as "cash" or the "risk-free" asset class, where the return associated with this asset class will be referred to as the "riskless" or "risk-free rate of return." Also, where needed, we computed the excess return for an asset as the total return for the asset minus the risk-free rate of return.

- *Wilshire 5000*. Asset class composition: 100 percent equities. This is a static composition portfolio. It represents the equity asset class with a greater allocation to smaller capitalization stocks than the S&P 500.

- *Barclays Capital Long-Term Government Credit Index*. Asset class composition: 100 percent fixed income. This is a static composition portfolio representing the fixed-income asset class, including both corporate and U.S. government fixed-income asset classes.

- *Pension Protection Act Benchmark Portfolio*.[5] Asset class composition: 60 percent equities and 40 percent fixed income. This is a static composition portfolio.[6]

- *Life Insurance Benchmark*. Asset class composition: 85 percent fixed income and 15 percent equities. This is a static composition portfolio, and is intended as a stylized representation of the asset portfolio typically held by life insurance firms in their general accounts (with grouping mortgage assets into the fixed-income category).[7]

- *Post Fiscal Year 2002 Benchmark*. Asset class composition: 30 percent equities, 60 percent fixed income, and 10 percent cash. This is a static composition portfolio, and is intended as a stylized representation of the average asset allocation of the PBGC total fund during what is later termed "asset allocation period 4." This roughly corresponds to the period from beginning of fiscal year 2002 to the present.

- *Dynamic Benchmark*. Asset class composition: equivalent to the asset class composition for the PBGC Total Fund. This is a dynamic composition portfolio, where the asset allocation varies over time in such a fashion so as to match that of the PBGC Total Fund for the broad asset classes domestic equity, foreign equity, fixed income, and riskless short

[5]The Pension Protection Act of 2006 requires PBGC to compare its average return performance for its investments to a theoretical portfolio consisting of an equity benchmark portfolio and a fixed-income benchmark portfolio. No. 109-280, § 412, 120 Stat. 780, 936.

[6]We used the Barclays Capital Long-Term Government Credit Index to construct the PPA benchmark instead of the Barclays Capital Aggregate Bond Index, which is more customary, in order to achieve greater comparability to the Barclays Capital Long-Term Government Credit Index listed in item c as a fixed-income benchmark in this report. Note that PPA allows for the use of fixed-income indices other than the Barclays Capital Aggregate Bond Index in the construction of PPA benchmark returns.

[7]GAO-08-667, 10–11.

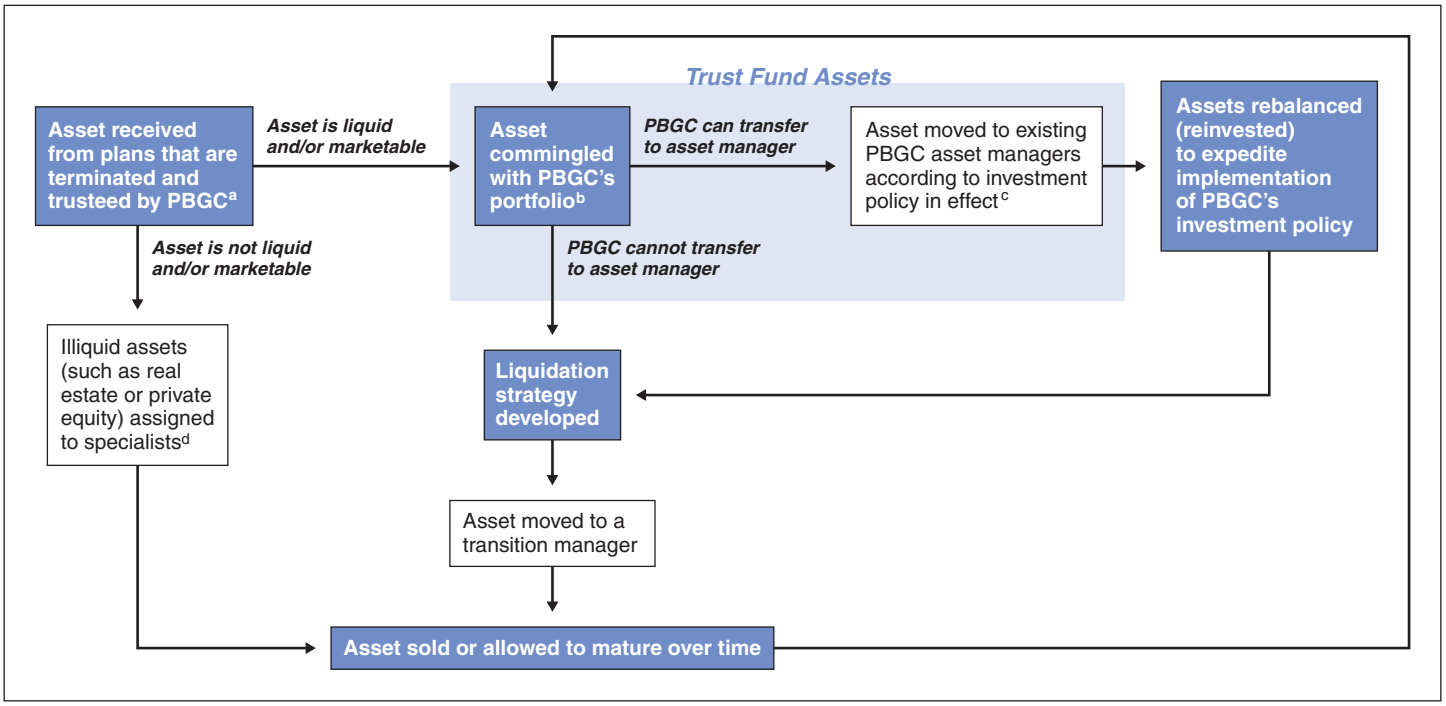
maturity fixed-income assets (e.g., cash). The purpose of the Dynamic Benchmark in the PBGC Total Fund portfolio performance evaluation is to reflect the systematic risk exposure of the PBGC Total Fund as closely as possible while at the same time abstracting from any active tactical asset allocation undertaken by the PBGC Total Fund management, such as tactical allocations in specific subsectors within an asset class or investments in specific individual securities.

The comparisons allowed us to analyze various aspects of the PBGC Total Fund's risk-adjusted performance. Given that the primary function of PBGC is to support its liabilities—the pension benefits associated with terminated, trusteed plans—the portfolio performance evaluation was conducted using asset-only returns and asset returns net of the liability return.

To determine how well PBGC's investment policies and operations comport with best practices in the industry, we interviewed PBGC's Inspector General, current PBGC board member's representatives, and PBGC staff. We also reviewed relevant federal laws and regulations. To evaluate PBGC's operational guidelines and procedures, we obtained procedures manuals and documents that PBGC's staff uses to manage and oversee their operations. To evaluate PBGC's investment policy statements against industry best practices, we obtained information and documentation of actual practices used by industry experts, foreign pension insurers in Canada, the Netherlands, Switzerland, and the United Kingdom, investment committee documents from large state pension plan providers, and a property and casualty insurance provider. To identify a list of items that could be included in an investment policy we first conducted a literature search for documents with guidance on investment policy statements. We found documents from expert organizations which provide standards that financial industry professionals follow to ensure they are meeting the fiduciary requirements under relevant state and federal laws. These organizations include the Chartered Financial Analyst Institute, the Foundation for Fiduciary Studies, the Association of Pension Plan Fund Auditors, the Government Finance Officers Association, and Independent Fiduciary Services. We started with the Chartered Financial Analyst Institute's documents and listed elements of an investment policy identified in a document created by the institute and then compared that list to elements identified in the documents we reviewed created by other organizations. We also considered the investment policy statements of other entities and the elements that were frequently found in those statements. In our list, we kept items that were mentioned in more than one of the documents from the five expert organizations. We also added

one item, transition policy, which was not found in the documents we used but we believe that it is specific and unique to the mission of PBGC since the agency transitions assets and liabilities from the defined benefit plans that are terminated. This list contains elements that multiple industry organizations have identified as desirable elements of investment policy statements, but, should not be considered an exhaustive, customized checklist. While we believe that PBGC should have some of the items contained in these lists, because every investor is unique, the actual items that PBGC should include in its investment policy needs to be tailored to their particular needs and situation.

Appendix II: Process for Transitioning Funds to Align with PBGC's Investment Policy



Source: GAO analysis of PBGC's Corporate Investment Department Policies and Procedures Manual (draft dated 6/1/2010) and discussions with PBGC personnel.

[a]Receipt of newly-terminated plan assets is a multi-step process. Assets are evaluated by an analyst with PBGC's Corporate Investment Department (CID).CID policy calls for various documents to be compiled into a file (including, for example, a plan asset listing, investment statements, trusteeship agreement, contact information), records receipt of the plan in CID's plan tracking worksheet, and assigns the plan to a CID analyst. The analyst then reviews the file and makes contact with the party/parties that have custody of the assets (typically more than one) to initiate the transfer, and a plan asset transfer methodology is determined. PBGC officials noted that it is CID priority to transfer all assets in-kind, but that is not always permitted (per contractual agreements between the former plan sponsor and the asset custodian and/or proprietary investment products) or optimal (for example, with small dollar mutual funds). To transfer the assets, the analyst prepares a direction letter that will include a copy of the trusteeship agreement and transfer instructions at a minimum. This letter is signed by authorized PBGC personnel and sent to the asset custodian. The assets are then transferred to PBGC's asset custodian and placed in a holding account until liquidity is determined and a certain dollar threshold is met.

[b]PBGC officials noted that transfers of assets in-kind to existing investment managers can be done at minimal cost; however, decisions regarding whether or not assets will be transferred to existing investment managers are also impacted by PBGC's investment policy and the current asset allocation. For example, if there is a large equity position in a holding account and the PBGC investment portfolio is already at or near the maximum equity exposure permitted by the investment policy, these assets will typically be liquidated into cash. An exception may be if the amount of equities in the holding account is considered *de minimus* (for example, $50 million in equities going into a $70 billion portfolio) and there is minimal to no cost to transfer the assets to a manager.

[c]PBGC officials noted that assets received in the form of cash are immediately considered part of the PBGC investment portfolio and can be utilized in various ways, such as contributing to existing investment managers, paying trust fund expenses, and contributing to the proportional funding payment to the revolving fund.

[d]Illiquid assets, such as real property, are generally transferred to PBGC's Special Situation manager, where the manager seeks liquidation of the asset in a timely manner. Private equity (generally in the form of limited partnerships) is transferred to one of PBGC's private market overseers.

Appendix III: Asset-Only and Net of Liability Analysis of Pension Benefit Guarantee Corporation's Single-Employer Total Fund

We conducted a portfolio performance evaluation of the PBGC Single-Employer Total Fund monthly returns from the period October 1976 to December 2009. This analysis focused on the single-employer program, which accounted for 96 percent—or $21.08 billion—of the $21.95 billion total deficit from the single-employer and multiemployer programs, as of September 30, 2009.[1] For those portions of this analysis involving PBGC liabilities, we used data on the liabilities associated with (terminated) trusteed plans within the single-employer program.[2] The Single-Employer Total Fund represents the pool of trusteed assets that supports the liabilities associated with terminated defined benefit plans that have been trusteed by PBGC.

As part of the portfolio performance evaluation, we compared PBGC's Total Fund portfolio return performance to the returns on several well-diversified benchmark portfolios via a number of portfolio performance statistics. The comparisons allowed us to analyze various aspects of the PBGC Total Fund's risk-adjusted performance. Given that the primary function of PBGC is to support its liabilities—the pension benefits associated with terminated, trusteed plans—the portfolio performance evaluation was conducted using asset-only returns and asset returns net of the liability return. The liability return refers to the rate of growth in the total value of the then-existing liabilities or terminated benefits, (i.e., exclusive of newly terminated plans). In computing the asset returns net of the liability return, we use what we term the "scaled" liability return—the product of the liability return and the inverse of the funding ratio (PBGC Total Fund aggregate assets to PBGC total fund aggregate liabilities).[3]

[1]Given the emphasis on the PBGC Single-Employer Total Fund in our analysis, the phrase "PBGC Total Fund portfolio" will be used for brevity for the remainder of this section and should be understood to refer to the Single-Employer Total Fund at PBGC.

[2]Our analysis includes only liabilities from trusteed defined benefit plans (instead of all terminated plans, both trusteed and pending trusteeship by PBGC) because, according to PBGC, it is ultimately liable only for the trusteed plans—not all terminated plans.

[3]We use this definition of the asset return net of the liability return because research shows that this is equivalent to maximizing the end-of-month surplus (the end-of-month difference between aggregate assets and liabilities) relative to the aggregate asset value at the beginning of the month. William F. Sharpe, "Budgeting and Monitoring Pension Fund Risk," *Financial Analysts Journal*, Vol. 58 (2002), 74–86; and William F. Sharpe and Lawrence Tint, "Liabilities--A New Approach," *Journal of Portfolio Management*, Vol. 16 (1990), 5–10.

Our analysis also entailed examining patterns in the PBGC Total Fund's asset allocations (PBGC Total Fund portfolio "weights" across asset classes) over time in order to assess the effect of fluctuations in the PBGC Total Fund asset allocations on the performance of the PBGC Total Fund. This analysis included characterizing the behavior of the PBGC Total Fund portfolio weights and identifying asset allocation periods in the PBGC Total Fund. The result of this analysis was used in selecting some of the benchmark portfolios.

Liability Returns

Monthly liability returns were provided by PBGC for the October 2003 to January 2010 period. For the period prior to October 2003, we estimated the liability returns using an algorithm designed to approximate the liability return generation methodology employed by PBGC. The overall approach involved estimating the present value of the liabilities, including the aggregate benefit payment, at the end of each month (referred to by PBGC as the present value of future benefits). The two major data components for computing the liability return are (1) the identification of appropriate interest rates for use each month in discounting the projected cash flows and (2) the monthly approximation of the projected PBGC liability cash flow stream for each month during the October 1976 to September 2003 time period.

To determine the appropriate interest rates for discounting the projected cash flows we used two interest rate factors obtained from PBGC that it uses in computing estimates of the present value of its liabilities—the "select" and "ultimate" rates.[4] For the period prior to September 1993, we used a set of interest rates based on what PBGC terms the "immediate" interest rate. To produce monthly approximations of the projected liability cash flow stream, we transformed quarterly projections supplied by PBGC into a monthly series starting with the first fiscal year for which the present value of the trusted liability was available, September 1976, using the algorithm we developed. For each month the liability return is calculated as the monthly percentage change in the estimated present value of the liabilities plus the estimated benefit paid at the end of the month divided by the estimated present value of the liabilities at the end of the previous month.

[4]These rates effectively form a yield curve where cash flows that occur during the initial period are discounted by the "select" interest rate and those occurring after the initial period are discounted by the "ultimate" interest rate. For more on these rates see http://www.pbgc.gov/prac/interest.html.

Because our liability return methodology relies upon estimates of what PBGC would have hypothetically projected the future liability cash flow to be, it is subject to error. Additionally, our liability return measure is sensitive to valuation assumptions and other inputs, such as our choice of discount rates, used to calculate the present value of the expected of the expected future payments. Moreover we relied on a static set of cash flows unlike the actual cash flow projection that PBGC would have produced in the past. Such projections would vary over time due to alterations in the assumed beneficiary survival probabilities as a consequence of any changes in the choice of mortality tables, among other things. Also, the algorithm, in approximating the way in which PBGC calculates its present value calculations, implicitly assumes the all beneficiaries were receiving cash flows. Despite these limitations the correlation of the series produced by our liability return estimation algorithm and PBGC's liability returns was 0.9994, suggesting near perfect correlation. Thus, despite the limitation, we believe that our liability return generating algorithm produces estimates that are robust.

It should be noted that incoming cash flows from newly terminated plans are not included in the measure of liability return. This exclusion is consistent with approaches we have reviewed and the liability return estimates produced by PBGC.[5] However, some pension experts have advocated that any assessment of PBGC investment policy take into account the correlation between new plan terminations and financial market performance. Specifically, given the possibility of a negative correlation between stock market returns and new plan terminations, an economic environment in which the stock market suffers losses could potentially be accompanied by an increase in new plan terminations of underfunded plans and a deterioration in the funded status of existing trusteed plans. Incorporating the correlation between stock market returns and new claims could result in lower risk adjusted performance for portfolios with a heavier weighting toward stock. While such an analysis would be methodologically more complex and is beyond the scope of this report, consideration could be given to including this phenomenon in an expanded study. While the risk of new plan terminations could also be addressed through a more actuarial approach to setting PBGC premiums, such an approach would not eliminate the

[5]Implicitly it assumed that these liabilities are best dealt with via the setting of premiums as opposed to being covered by the investment portfolio.

existence of correlation risk between PBGC's investment portfolio and the amount of newly terminated plans.

Our methodology also requires an estimate of the funding ratio since, as mentioned previously, following Sharpe (2002) and Sharpe and Tint (1990), our measure of the liability return is scaled by the inverse funding ratio (the greater PBGC's deficit the more weight liability returns are given within the asset net of liability framework). As a result greater credit was given to portfolios that correlated with liabilities when the PGCG experienced a greater degree of underfunding. Using a scaled liability return measures the net effect of the asset and liability returns on the dollar amount of surplus or deficit; an alternative approach would have been to use the un-scaled liability return, which would measure the net effect of the asset and liability returns on the funding ratio. Moreover, while we have given full weight to the scaled liability return, others may place less importance on liabilities. Note, however, that the lower the weight given to the scaled liabilities the more the approach will resemble outcomes in the asset-only framework. We define the funding ratio as the ratio of the PBGC total fund trusteed asset portfolio to the present value of the PBGC total fund trusteed liabilities. Because the data on liability values was unavailable for the September 1976 to September 1978 period, we computed estimates using the present value of future benefits from PBGC annual and actuarial reports. Where the data was not directly available from a PBGC data source for a particular month we imputed these values using the existing data.[6]

Performance Statistics

The portfolio performance literature usually assumes that most investors (that is, economic agents who seek to allocate funds across a variety of assets) are risk averse.[7] Therefore, we assessed the performance of the PBGC total fund asset portfolio and the benchmark portfolios using statistics that measure and summarize the magnitude of the portfolio returns, the riskiness of the portfolio returns, and the optimality of the trade-off between the magnitude and the riskiness of the portfolio returns

[6]For the end of any month for which an observation was not directly available, we estimated the value using the last available total fund asset portfolio value preceding that month and the gross liability return over the period corresponding to the missing data.

[7]Richard A Brealey and Stewart Myers, *Principles of Corporate Finance*, (New York: McGraw-Hill, Inc., 1981). John L. Maginn, Dennis McLeavey, Jerald Pinto, and Donald Tuttle, (eds.) *Managing Investment Portfolios*, (New York: John Wiley & Sons, 2007).

(risk-return trade-off). Statistics which measure the magnitude of the portfolio returns include the mean, minimum, and maximum; statistics which measure the riskiness of the returns include the standard deviation, semi-standard deviation, skewness, kurtosis, Value At Risk, and expected shortfall; and statistics which quantify the trade-off between the magnitudes of risk and return include the Sharpe, Sortino, Omega, and Adjusted Sharpe measures. Higher values of the statistics that measure risk imply that greater riskiness, volatility, or uncertainty is associated with the portfolio returns. Higher values of the statistics that measure the magnitude of portfolios returns imply larger portfolio return values. Higher values of the statistics that quantify the optimality of the reward to risk trade-off imply better trade-offs between the magnitude of portfolio returns and the riskiness associated with them and thus, better risk-adjusted portfolio performance. The performance statistics used in this report are well-established measures but they are not the only statistics that could have been reviewed.

Another important element of any performance statistic is the unit of time measurement. Our analysis measures returns on a monthly basis, and measures risk based on the variation in month-to-month returns. Using a different unit of time, such as a single year or even a multi-year period, could give a different picture of the risk or reward tradeoff.[8] Another decision in any performance assessment is whether to do the analysis on a time-weighted or a dollar-weighted basis. A time-weighted basis gives equal weight to each unit of time; thus, a monthly rate of return in 1976 gets just as much weight in the analysis as a monthly rate of return in 2009. A dollar-weighted basis gives greater weight to the periods when more money is at stake; since PBGC's portfolio of assets and liabilities was many times bigger in 2009 than it was in 1976, performance in 2009 was of greater economic consequence than performance in 1976. We used a time-weighted basis for our analysis, in order to focus on investment performance itself, rather than on the particular economic consequences in the time period under study.

[8]Another element of an analysis of this type is the length of the time horizon and, if applicable, the particular calendar years studied. Our analysis looks at the single historical period, from 1976 through 2009, since the purpose of the analysis was performance assessment, not asset allocation recommendations. Typically, analyses for the purpose of asset allocation would project forward over multiple potential future economic scenarios in order to more fully assess potential risk and reward.

In the list that follows, we provide observations and descriptions of the performance statistics used, where t is a monthly time index; $R_{P,t}$ is the return on a portfolio P from time $t-1$ to time t; $R_{f,t}$ is the risk-free rate from time $t-1$ to time t; T is the number of months for which there is return data; and E[] is the expectation operator such that E[$R_{P,t}$] is the mean of the return on portfolio P ; and σ_P is the standard deviation of $R_{P,t}$:

- *Semi-standard deviation.*[9] The semi-standard deviation is similar to the standard deviation except that it focuses more tightly on the portion of the return variability that is associated with low returns. There are multiple definitions of the semi-standard deviation; the one used in our analysis is

$$SD = \sqrt{\frac{1}{T} \sum_{\substack{t=0 \\ R_{P,t}<MAR}}^{T} (R_{P,t} - MAR)^2}$$

  where *SD* is used to denote the semi-standard deviation and *MAR* is defined as the "minimum acceptable return."

- *Value At Risk (VaR).*[10] VaR of the returns is the negative of a quantile of the probability distribution of the returns over a given time horizon, where the quantile is often referred to as "alpha" (α). Once α and a time horizon (arbitrarily labeled T^* here) are specified, then VaR is defined as the negative of the value such that the probability that a rate of return over time horizon T^* will fall at or below that value is α. For example, if the probability that the 1-month portfolio return will fall at or below negative 4 percent is equal to 1 percent, then the 1 percent alpha VaR of the 1-month returns is 4 percent (not negative 4 percent).

  As an alternative to α, VaR is often expressed in connection with a "confidence level" where the confidence level is defined as $1-\alpha$.[11] In the previous example, the 99 percent confidence VaR was 4 percent.

[9]Sources for semi-standard deviation equation: Amenc and LeSourd (2003), 54 and 116; Sortino and Price (1994).

[10]Source for VaR equation: Pearson (2002), 4 and 10–11.

[11]The notion of the confidence level is similar to but not to be confused with the concepts of significance level and confidence intervals from statistics. (Pearson (2002), 10–11).

Under the assumption that portfolio returns are normally distributed, one can estimate VaR as

$$VaR = \mathbf{E}[R_{P,t}] - z_{1-\alpha}\sigma_P$$

where $z_{1-\alpha}$ is the $1-\alpha$ quantile of the normal distribution and σ_P is the standard deviation of $R_{P,t}$.

- *Expected shortfall.*[12] Expected shortfall is the (negative of the) mean value of the returns, conditional upon the returns being below (negative of) VaR. In the context of the example in point (b), if the expected shortfall is 6 percent, then negative 6 percent is the mean value of the returns that are less than negative 4 percent. Under the assumption that the returns $R_{P,t}$ are normally distributed, the expected shortfall can be computed as

  where *ES* denotes expected shortfall, $\phi(\cdot)$ is used to denote the standard normal probability density function, and $\phi(z1-\alpha)$ is standard normal probability density function evaluated at $z_{1-\alpha}$.

$$ES = \mathbf{E}[R_{P,t}] - \frac{\phi(z_{1-\alpha})}{\alpha}\sigma_P$$

- *The Sharpe ratio.*[13] The Sharpe ratio is the ratio of the expected excess return to the standard deviation of the return. Letting *S* denote the Sharpe ratio, the Sharpe ratio can be computed as

$$S = \frac{\mathbf{E}[R_{P,t}] - R_{f,t}}{\sigma_P}$$

  The greater the value, the better the reward to risk trade-off for the portfolio. Portfolios that have higher Sharpe ratios have better risk-adjusted performance. Note that in the asset/liability management context, *RP*,*t* can represent the portfolio return net of the liability return.

[12]Source for expected shortfall equation: Dowd (2005), 154.

[13]Sources for Sharpe ratio: Sharpe (1966); Amenc and LeSourd (2003), 109.

- *The Sortino ratio*.[14] The Sortino ratio is the ratio of the expected return in excess of the minimum acceptable return (MAR) to the semi-standard deviation. The general expression is

$$S_{Sortino} = \frac{\mathbf{E}[R_{P,t}] - MAR}{\sqrt{\frac{1}{T} \sum_{\substack{t=0 \\ R_{P,t}<MAR}}^{T} (R_{P,t} - MAR)^2}}$$

where $S_{Sortino}$ is used to denote the Sortino ratio. The advantage of this performance measure is that it reflects the trade-off between the magnitude of return and the risk associated with undesirable return outcomes (such as returns falling below the MAR) more specifically than the Sharpe ratio does. In this work, an annualized Sortino ratio for the excess returns is utilized. The applicable equation in this case is

$$S_{Sortino} = \frac{\mathbf{E}[R_{P,t}] - R_{f,t}}{\sqrt{12\left(\frac{1}{T} \sum_{\substack{t=0 \\ (R_{P,t}-R_{f,t})<0}}^{T} (R_{P,t} - R_{f,t})^2\right)}}$$

Higher Sortino ratio values indicate better risk-adjusted portfolio performance.

[14]Sources for Sortino ratio: Amenc and LeSourd (2003), 54 and 116; Sortino and Price (1994).

- *The Omega ratio*.[15] The Omega ratio is a risk-reward trade-off measure that is designed to adjust for the impact of outliers and deviations of the return distribution from normality. The general definition of the Omega ratio (denoted by Ω) is

$$\Omega = \frac{\frac{1}{T}\sum_{t=1}^{T}\max(R_{P,t} - R_{f,t}, 0)}{\frac{1}{T}\sum_{t=1}^{T}\max(R_{f,t} - R_{P,t}, 0)}$$

- *The Adjusted Sharpe ratio*.[16] Israelsen showed that when the expected excess returns for portfolios are negative, the traditional Sharpe ratio can yield portfolio performance rankings that are not consistent with the standard notions that investors are risk averse and also prefer portfolios with higher returns to portfolios with lower returns. To address this problem, Israelsen modified the Sharpe ratio as follows:

$$S_{adj} = \frac{\mathbf{E}[R_{P,t}] - R_{f,t}}{\sigma_P^{\frac{\mathbf{E}[R_{P,t}]-R_{f,t}}{\mathrm{abs}(\mathbf{E}[R_{P,t}]-R_{f,t})}}}$$

where S_{adj} denotes the Adjusted Sharpe ratio and abs(E[$R_{P,t}$]-$R_{f,t}$) is the absolute value of E[$R_{P,t}$]-$R_{f,t}$. Higher Adjusted Sharpe ratio scores imply superior risk-adjusted performance. Note that when expected excess returns are negative, the Adjusted Sharpe ratio is negative, and higher Adjusted Sharpe ratios are those that are *less negative* (in other words, smaller in absolute value).

[15]Source for Omega ration: Bacon (2008), 94.

[16]Source for Adjusted Sharpe ratio: Israelsen (2009).

- *Skewness (sample skewness)*.[17] The skewness statistic indicates the extent of extreme return values above or below the mean return. Positive skewness implies the incidence of a large number of extreme returns above the mean return; accordingly, negative skewness implies the incidence of a large number of extreme returns below the mean. The normal distribution has a skewness value of zero. To estimate the skewness of the portfolio returns, the following equation was used, which incorporates a correction for bias (denoting skewness by *sk*):

$$sk = \frac{\sqrt{T(T-1)}}{T-2} \frac{\frac{1}{T}\sum_{t=1}^{T}(R_{P,t} - \mathbf{E}[R_{P,t}])^3}{\left(\sqrt{\frac{1}{T}\sum_{t=1}^{T}(R_{P,t} - \mathbf{E}[R_{P,t}])^2}\right)^3}$$

- *Kurtosis (sample kurtosis)*.[18] The kurtosis provides a measure of the incidence of extreme return values above and below the mean return. The higher the kurtosis, the greater the number of extreme return values both above and below the mean return within the sample of returns. Visually, a probability density with a large kurtosis value will appear to have fat "tails." The normal distribution has a kurtosis of three. As with the skewness, the kurtosis was estimated using an equation that incorporates a sample-size bias correction. Denoting the kurtosis by *k*, the kurtosis equation utilized is

$$k = 3 + \frac{T-1}{(T-2)(T-3)}\left((T+1)\frac{\frac{1}{T}\sum_{t=1}^{T}(R_{P,t} - \mathbf{E}[R_{P,t}])^4}{\left(\frac{1}{T}\sum_{t=1}^{T}(R_{P,t} - \mathbf{E}[R_{P,t}])^2\right)^2} - 3(T-1)\right)$$

[17]Sources for skewness equation: Bacon (2008), 83-84; Matlab R2010a Documentation.

[18]Sources for kurtosis equation: Bacon (2008), 85-86; Matlab R2010a Documentation.

Selected Benchmarks

We selected well-diversified benchmark portfolios for the portfolio performance evaluation to ensure that the variability of the benchmark portfolio returns almost exclusively represented systematic risk and not the idiosyncratic risk associated with individual securities. Also, the portfolios were selected such that they represented exposure to the systematic risks that are reflected in the returns on several specific, broad asset classes. The asset classes are the domestic equity asset class (United States), the foreign equity asset class, the short maturity, risk-free asset class, and the long maturity fixed-income asset class. These particular asset classes were chosen because they are the ones emphasized in asset allocation data provided by PBGC.[19] The benchmark portfolios used in this analysis are also distinguished by whether their asset class composition varies dynamically over time ("dynamic" composition portfolios) or is constant over time ("static" compositions portfolios). The static composition portfolios are assumed to be rebalanced monthly. The benchmark portfolios and their characteristics are as follows:

- *S&P 500*. Asset class composition: 100 percent equities. This is a static composition portfolio that represents the equity asset class.
- *Wilshire 5000*. Asset class composition: 100 percent equities. This is a static composition portfolio. It represents the equity asset class with a greater allocation to smaller capitalization stocks than the S&P 500.
- *Barclays Capital Long-Term Government Credit Index*. Asset class composition: 100 percent fixed income. This is a static composition portfolio representing the fixed-income asset class (including both corporate and U.S. government fixed-income asset classes).
- *PPA Benchmark Portfolio*.[20] Asset class composition: 60 percent equities and 40 percent fixed income. This is a static composition portfolio.[21]

[19]For the remainder of this section, the domestic equity class as "domestic equities"; the international equity class as "international equities"; the domestic and international equity classes combined as "equities"; the fixed-income asset class as either "bonds" or "fixed income"; and the short maturity fixed-income sector that is free of systematic and credit risk as "cash" or the "risk-free" asset class, where the return associated with this asset class will be referred to as the "riskless" or "risk-free rate of return." Also, where needed, we computed the excess return for an asset as the total return for the asset minus the risk-free rate of return.

[20]PPA requires PBGC to compare its average return performance for its investments to a theoretical portfolio consisting of an equity benchmark portfolio and a fixed-income benchmark portfolio. Pub. L. No. 109-280, § 412, 120 Stat. 780, 936.

- *Life Insurance Benchmark*. Asset class composition: 85 percent fixed income and 15 percent equities. This is a static composition portfolio. This is intended as a stylized representation of the asset portfolio typically held by life insurance firms in their general accounts (with grouping mortgage assets into the fixed-income category).[22]

- *Post Fiscal Year 2002 Benchmark*. Asset class composition: 30 percent equities, 60 percent fixed income, and 10 percent cash. This is a static composition portfolio. This is intended as a stylized representation of the average asset allocation of the PBGC Total Fund during what is later termed "asset allocation period 4." This roughly corresponds to the period from beginning of fiscal year 2002 to December 2009.

- *Dynamic Benchmark*. Asset class composition: equivalent to the asset class composition for the PBGC Total Fund. This is a dynamic composition portfolio, where the asset allocation varies over time in such a fashion so as to match that of the PBGC Total Fund for the broad asset classes domestic equity, foreign equity, fixed income, and riskless short maturity fixed-income assets (e.g., cash). The purpose of the Dynamic Benchmark in the PBGC Total Fund portfolio performance evaluation is to reflect the systematic risk exposure of the PBGC Total Fund as closely as possible while at the same time abstracting from any active tactical asset allocation undertaken by the PBGC Total Fund management (such as tactical allocations in specific subsectors within an asset class or investments in specific individual securities).

PBGC Asset Allocations Over Time

Our analysis of PBGC's asset allocations for the Total Fund indicate several broad behaviors:

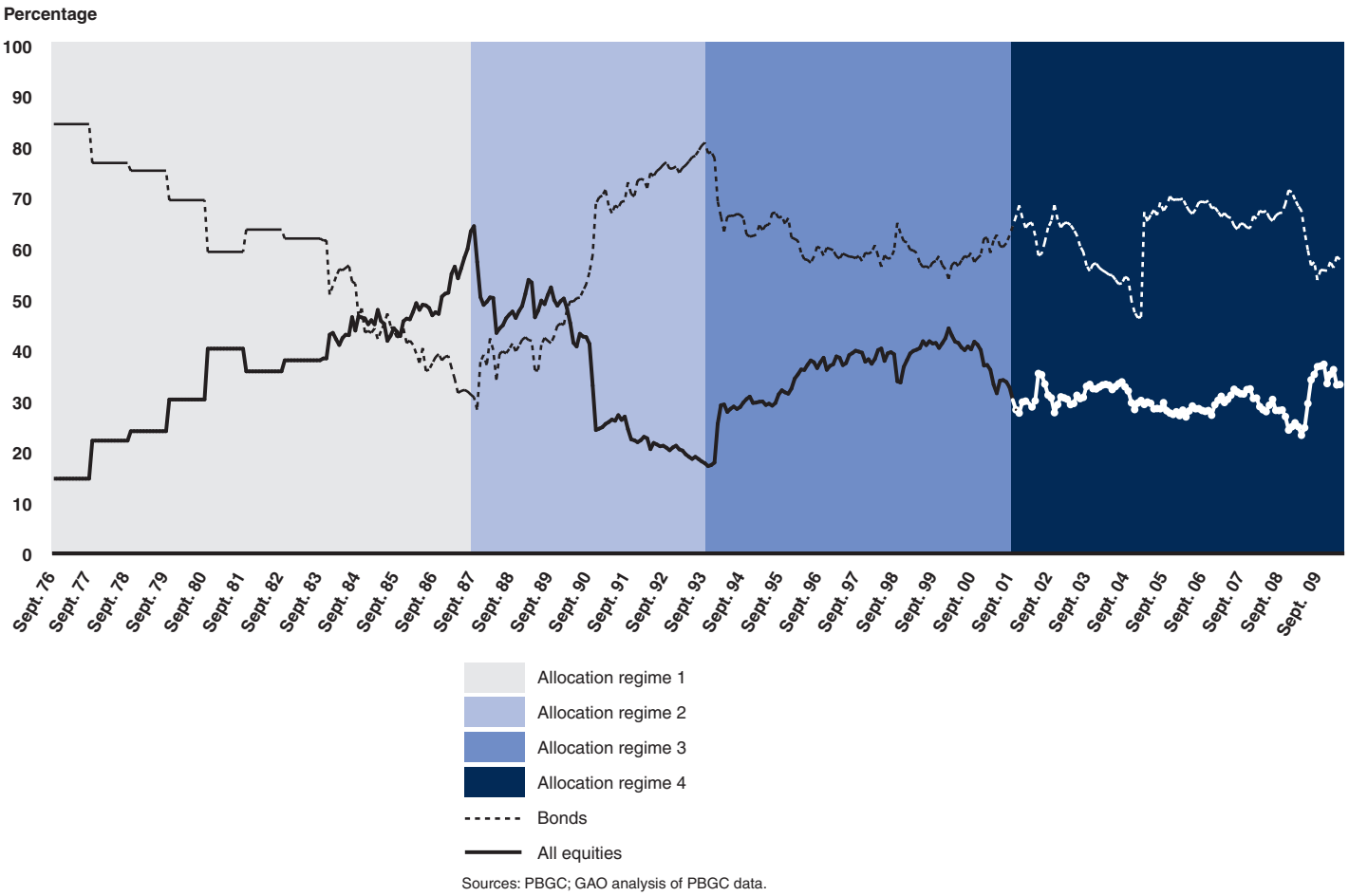
1. The PBGC total fund asset allocations have varied over the time period from September 1976 to December 2009 indicating that the PBGC Total Fund is a dynamic asset portfolio (see fig. 4). However, since November 2001, the combined allocation to both domestic and international equities has been more stable than it was in the period before November 2001, since the standard deviation of the total fund portfolio allocation

[21]We used the Barclays Capital Long-Term Government Credit Index to construct the PPA benchmark instead of the Barclays Capital Aggregate Bond Index (which is more customary) in order to achieve greater comparability to the Barclays Capital Long-Term Government Credit Index listed in item c as a fixed-income benchmark in this report. Note that PPA allows for the use of fixed-income indices other than the Barclays Capital Aggregate Bond Index in the construction of PPA benchmark returns.

[22]GAO-08-667, 10–11.

to equities has been 2.82 percent since November 2001, which is distinctly less than the standard deviation of the equity weight prior to that time, which was 10.58 percent per month. See table 1 below. With the exception of cash, the standard deviation values of all the asset classes shown in table 1 were lower in the period from November 2001 to December 2009 than in the period prior to November 2001, suggesting that PBGC asset allocations have been less variable for over the last 8 years than they were in the more distant past with the exception of the relatively small cash category. While some have characterized PBGC Total Fund's asset allocations as time-varying, this seems more relevant to the period from September 1976 to October 2001 than to the last approximately 8 years (the period since November 2001).

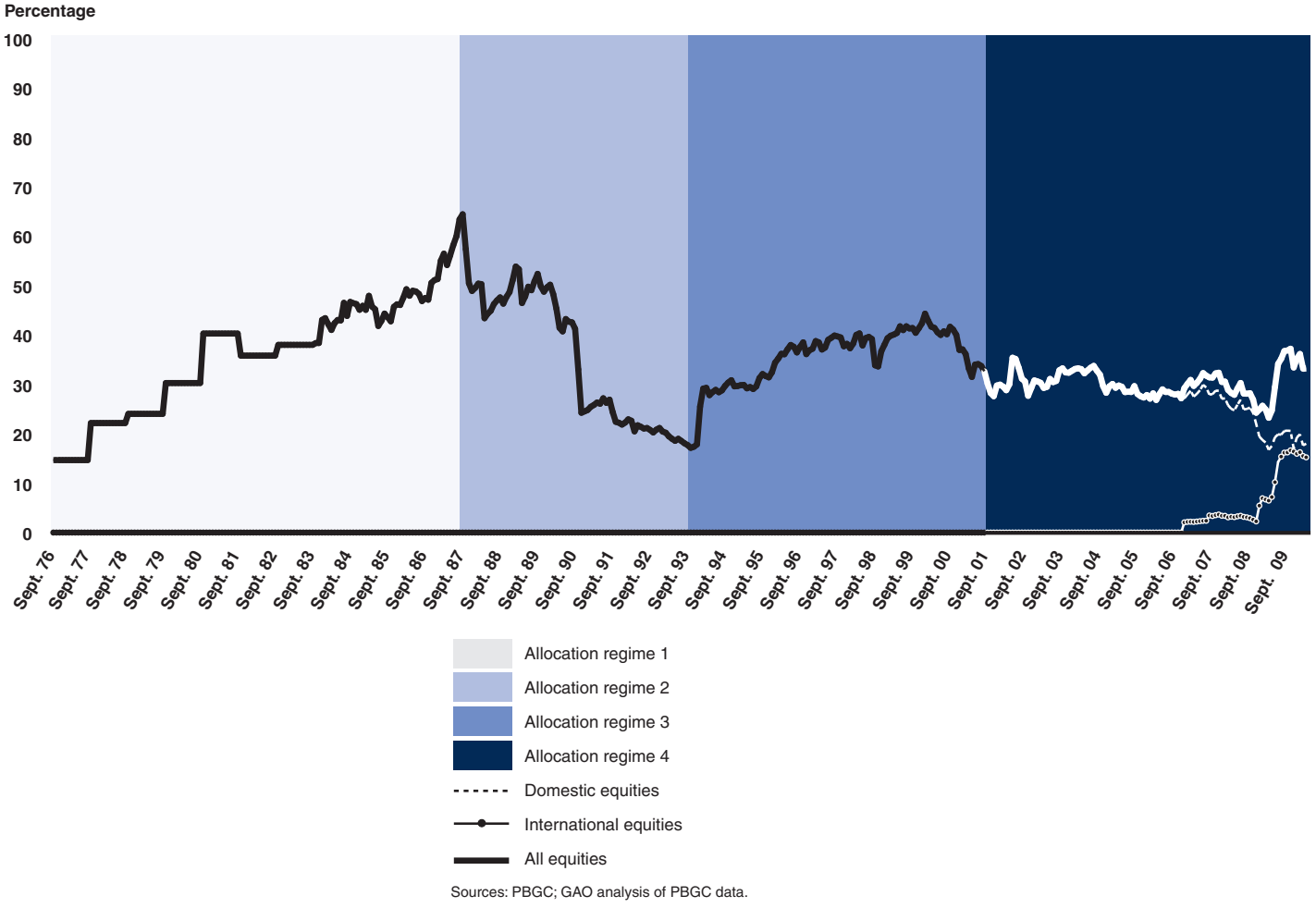
Figure 4: Allocations of Bonds and Equities in PBGC Total Fund, September 1976 to December 2009



Sources: PBGC; GAO analysis of PBGC data.

2. However, one aspect of the PBGC Total Fund asset allocation that has altered significantly since October 2008 is the international and domestic allocation within the equity asset allocation. The PBGC Total Fund's allocation to international equities has grown from 2.26 percent at the end of October 2008 to 16.25 percent at the end of December 2009 (see fig. 5).

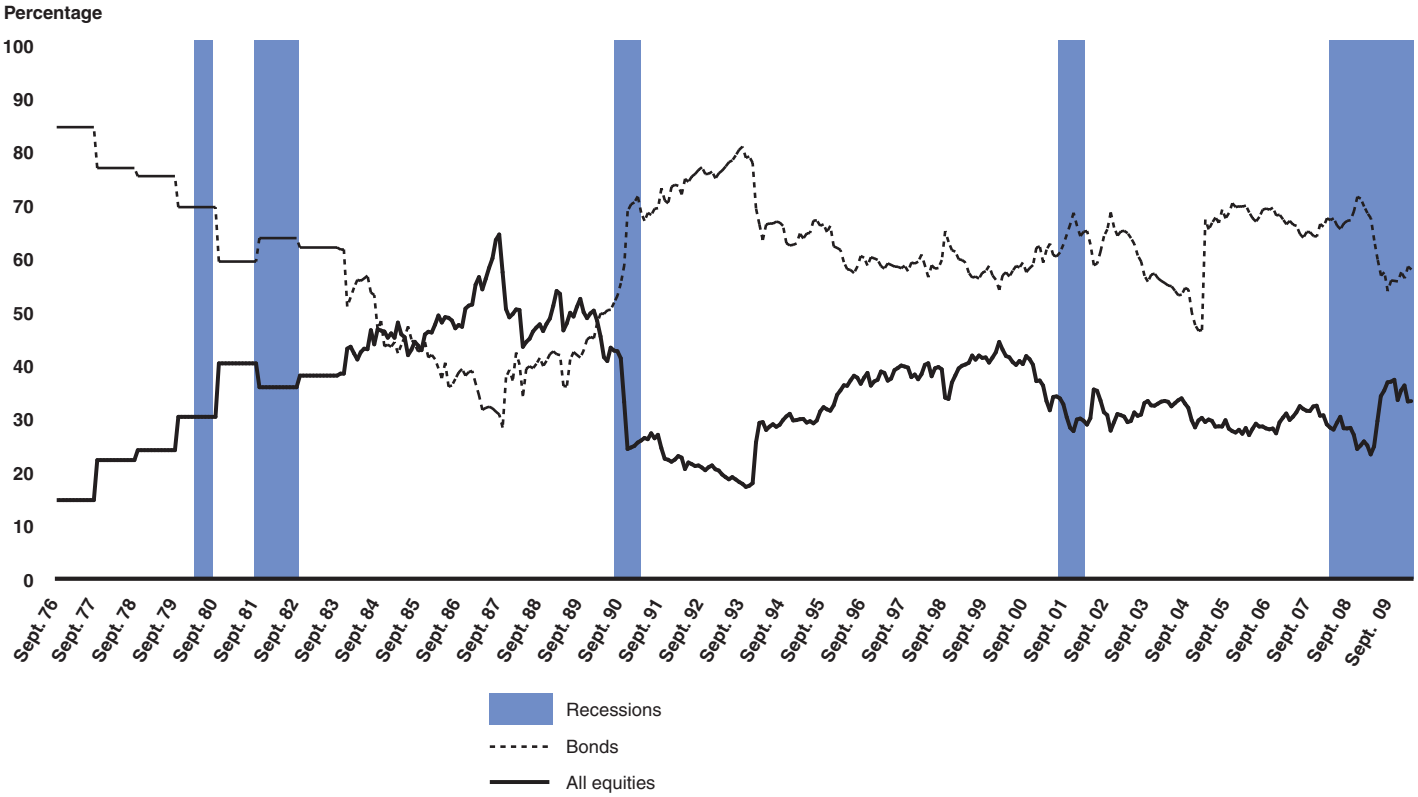
Figure 5: Allocation to Equities in PBGC Total Fund, September 1976 to December 2009



Sources: PBGC; GAO analysis of PBGC data.

3. The PBGC Total Fund has exhibited a tendency to reduce equity portfolio weight and increase bond portfolio weight at the start of economic recessions. As shown in figure 6, for three out of the last five recessions (including the most recent economic contraction), the portfolio allocation to equities has fallen either within 1 month of the start of the recession (1981–1982 and 1990–1991 recessions) or within 5 months of the recession (2000–2001 recession).

Figure 6: Allocation of Bonds and Equities in PBGC Total Fund, September 1976 to December 2009, with Business Cycle Shading



Sources: PBGC; GAO analysis of PBGC data.

Figures 4–6 and the statistics in table 5 suggest the following asset allocation periods for the PBGC Total Fund:

- *Asset allocation period 1*. This period (September 1976 to August 1987) was characterized by a trend of allocation away from bonds into equities such that the allocation altered from 15 percent equities, 84 percent bonds in September 1976 to 64 percent equities, 31 percent bonds by August

1987. By way of comparison, the PBGC Total Fund allocation in September 1976 (the beginning of the historical sample period) was similar to that found among life insurance companies.

- *Asset allocation period 2*. This period (September 1987 to September 1993) was marked by rebalancing away from equities towards fixed income that accelerated at the beginning of the 1990–1991 recession. In September of 1987, the allocations were 57 percent equities and 28 percent bonds, but this had shifted to 17 percent equities and 79 percent bonds by September 1993. As in September 1976, 17 years earlier, the portfolio composition was again qualitatively similar to the allocations associated with life insurance companies.

- *Asset allocation period 3*. Within this period (October 1993 to October 2001), the proportion of the PBGC portfolio allocated to equities rose from 17 percent in September 1993 to 28 percent by October 2001.

- *Asset allocation period 4*. (November 2001 to December 2009) Figure 5 indicates that the average weights on domestic equities and equities as a whole were smaller in this regime than in asset allocation period 3.

Table 5: Descriptive Statistics for PBGC Total Fund Portfolio Weights by Allocation Period, September 1976 to December 2009

Percent

Asset class	Period 1: September 1976 through August 1987	Period 2: September 1987 through September 1993	Period 3: October 1993 through October 2001	Period 4: November 2001 through December 2009	Periods 1–3: September 1976 through December 2001	All periods: September 1976 through December 2009
Average portfolio weight						
Domestic equity	35.95%	34.88%	35.49%	27.79%	35.54%	33.57%
International equity	0	0	0	2.69	0	0.67
All equities	35.95	34.88	35.49	30.29	35.54	34.24
Fixed income	60.42	58.18	61.14	62.9	60.11	60.8
Cash	2.07	4.08	2.65	4.28	2.74	3.12
Standard deviation ff portfolio weight						
Domestic equity	11.78	13.3	5.31	4.5	10.58	10.04
International equity	0	0	0	4.81	0	2.66
All equities	11.78	13.30	5.31	2.82	10.58	9.55
Fixed income	15.4	16.36	4.26	6.03	13.2	11.89
Cash	2.65	3.86	1.61	4.11	2.85	3.27

Source: GAO analysis of PBGC data.

PBGC Single-Employer Total Fund Outperformed Most of Its Benchmarks on an Asset-Only Basis, and Fluctuations in Asset Allocations Did Not Adversely Impact Asset-Only Performance

The results immediately below provide a two-way comparison, on an asset-only basis, of the PBGC Total Returns to the Dynamic Benchmark—the two dynamic portfolios among those included in our portfolio performance evaluation analyses. Due to the design of the Dynamic Benchmark, these results reflect PBGC Total Fund under- or over-performance linked to influences other than the asset class allocation, such as asset allocations to specific subsectors within an asset class or investments in specific securities. Then, in the following subsection, we assess the effect of variation in the PBGC Total Fund's asset allocation in an asset-only context by comparing the performance of the Dynamic Benchmark and the PBGC Total Fund against the static benchmark portfolios. Special emphasis was placed on analyzing the differences in performance between the portfolios that have particularly strong performance and the two portfolios with dynamic asset allocations. This special emphasis allows us to then assess whether the time variation in the asset allocations associated with the PBGC Total Fund and the Dynamic Benchmark appeared to hurt or help their risk-adjusted performance. Also, we examine whether the data suggests other aspects of asset allocation aside from variation in portfolio weights that might bolster or harm risk-adjusted return performance.

The performance statistics for this section are shown in table 6 unless otherwise noted. The phrases "decade subperiods" and "decade" will be used to denote the four subperiods—October 1976 through December 1979, 1980–1989, 1990–1999, and 2000–2009 for which statistical estimates are shown in table 6.

Table 6: Portfolio Performance Comparison Results, October 1976 through December 2009

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Total return (percentage)									
S&P 500	21.14%	408.49%	432.79%	-6.24%	429.38%	70.32%	176.74%	23.33%	2,977.25%
Barclays Capital Long-Term Government Credit Index	5.80	244.49	129.16	112.00	170.77	118.60	86.64	60.27	1,670.60
Wilshire 5000	39.97	376.63	405.39	2.75	481.40	72.08	157.39	34.54	3,364.44
PBGC Total Fund Return	18.68	238.35	220.90	68.12	238.55	98.58	112.39	51.72	2,066.41
PPA	15.31	351.45	287.49	35.35	315.79	91.95	141.82	41.47	2,630.29
Insurance Benchmark	8.25	272.26	162.71	91.65	203.71	112.68	100.38	56.75	1,928.82
Post Fiscal Year 2002 Benchmark	12.67	284.67	190.11	64.02	236.84	97.50	109.18	48.20	1,962.32
Dynamic Benchmark	11.55	305.14	208.87	61.19	273.03	87.42	114.97	49.72	2,150.16
PBGC Total Fund Return Net Investment Expenses	-	-	-	67.18	-	-	-	51.00	-
Monthly mean (percentage)									
S&P 500	0.56%	1.51%	1.48%	0.06%	1.40%	0.84%	1.16%	0.32%	0.97%
Barclays Capital Long-Term Government Credit Index	0.17	1.13	0.72	0.67	0.84	1.10	0.67	0.52	0.77
Wilshire 5000	0.95	1.46	1.44	0.14	1.48	0.86	1.09	0.41	1.01
PBGC Total Fund Return	0.46	1.10	1.01	0.46	1.00	0.99	0.81	0.45	0.82
PPA	0.41	1.36	1.17	0.30	1.18	0.95	0.97	0.40	0.89
Insurance Benchmark	0.23	1.19	0.83	0.58	0.93	1.06	0.75	0.49	0.80

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Post Fiscal Year 2002 Benchmark	0.33	1.20	0.91	0.44	0.99	0.96	0.79	0.43	0.80
Dynamic Benchmark	0.30	1.26	0.97	0.43	1.08	0.91	0.83	0.44	0.83
PBGC Total Fund Return Net Investment Expenses	-	-	-	0.46	-	-	-	0.45	-
Monthly mean excess return (percentage)									
S&P 500	-0.02%	0.82%	1.09%	-0.16%	0.70%	0.38%	0.77%	0.14%	0.52%
Barclays Capital Long-Term Government Credit Index	-0.42	0.43	0.32	0.45	0.15	0.64	0.29	0.34	0.32
Wilshire 5000	0.36	0.77	1.05	-0.08	0.78	0.40	0.70	0.23	0.56
PBGC Total Fund Return	-0.13	0.40	0.61	0.24	0.30	0.53	0.42	0.27	0.36
PPA	-0.18	0.66	0.78	0.08	0.48	0.48	0.58	0.22	0.44
Insurance Benchmark	-0.36	0.49	0.44	0.36	0.23	0.60	0.36	0.31	0.35
Post Fiscal Year 2002 Benchmark	-0.26	0.50	0.52	0.22	0.30	0.50	0.40	0.25	0.35
Dynamic Benchmark	-0.28	0.57	0.58	0.21	0.39	0.44	0.44	0.26	0.38
PBGC Total Fund Return Net Investment Expenses	-	-	-	0.24	-	-	-	0.27	-
Monthly standard deviation (percentage)									
S&P 500	3.83%	4.75%	3.88%	4.67%	4.25%	4.66%	4.36%	4.52%	4.42%
Barclays Capital Long-Term Government Credit Index	2.09	3.68	2.15	2.73	3.53	2.20	2.13	2.90	2.85
Wilshire 5000	4.09	4.87	3.95	4.77	4.41	4.70	4.45	4.60	4.52

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
PBGC Total Fund Return	1.77	3.17	2.42	2.31	2.80	2.93	2.28	2.31	2.59
PPA	2.83	3.58	2.79	3.06	3.40	3.16	2.93	3.01	3.15
Insurance Benchmark	2.13	3.41	2.13	2.46	3.32	2.18	2.06	2.59	2.67
Post Fiscal Year 2002 Benchmark	2.10	2.97	2.06	2.21	2.90	2.18	2.02	2.27	2.43
Dynamic Benchmark	2.17	3.53	2.32	2.45	3.21	2.85	2.31	2.47	2.77
PBGC Total Fund Return Net Investment Expenses	-	-	-	2.30	-	-	-	2.31	-
Annualized semi-standard deviation (percentage)									
S&P 500	9.38%	10.99%	8.36%	12.55%	8.88%	12.09%	10.26%	11.88%	10.64%
Barclays Capital Long-Term Government Credit Index	6.71	7.84	4.74	6.05	8.02	4.38	4.71	6.58	6.36
Wilshire 5000	9.68	11.56	8.76	12.85	9.48	12.45	10.85	11.97	11.04
PBGC Total Fund Return	5.22	7.35	5.00	5.57	6.15	7.14	5.00	5.65	5.97
PPA	7.57	7.58	5.94	8.00	7.21	7.40	6.59	7.81	7.26
Insurance Benchmark	6.66	7.07	4.57	5.66	7.37	4.47	4.40	6.10	5.93
Post Fiscal Year 2002 Benchmark	6.17	5.98	4.37	5.43	6.27	4.59	4.35	5.63	5.39
Dynamic Benchmark	6.58	7.61	5.04	5.91	6.87	7.11	5.01	6.01	6.30
PBGC Total Fund Return Net Investment Expenses	0.00	0.00	0.49	5.58	0.00	0.00	2.49	5.66	3.08

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Annualized arithmetic mean (percentage)									
S&P 500	6.77%	18.16%	17.75%	0.68%	16.78%	10.13%	13.93%	3.82%	11.64%
Barclays Capital Long-Term Government Credit Index	2.00	13.54	8.59	8.04	10.10	13.21	8.09	6.29	9.24
Wilshire 5000	11.38	17.57	17.25	1.66	17.77	10.34	13.07	4.93	12.07
PBGC Total Fund Return	5.47	13.17	12.06	5.57	11.95	11.85	9.76	5.44	9.78
PPA	4.86	16.32	14.08	3.62	14.11	11.36	11.60	4.81	10.68
Insurance Benchmark	2.71	14.24	9.97	6.94	11.11	12.75	8.97	5.92	9.60
Post Fiscal Year 2002 Benchmark	3.94	14.41	10.95	5.29	11.93	11.52	9.50	5.14	9.58
Dynamic Benchmark	3.65	15.17	11.65	5.18	13.01	10.86	9.92	5.32	9.95
PBGC Total Fund Return Net Investment Expenses.	-	-	-	5.51	-	-	-	5.38	-
Annualized mean excess return (percentage)									
S&P 500	-0.29%	9.79%	13.05%	-1.97%	8.44%	4.59%	9.27%	1.64%	6.24%
Barclays Capital Long-Term Government Credit Index	-5.07	5.17	3.89	5.40	1.76	7.67	3.43	4.11	3.84
Wilshire 5000	4.31	9.20	12.55	-0.99	9.42	4.80	8.41	2.75	6.66
PBGC Total Fund Return	-1.60	4.79	7.36	2.92	3.60	6.31	5.09	3.26	4.38
PPA	-2.21	7.94	9.39	0.98	5.76	5.82	6.93	2.63	5.28
Insurance Benchmark	-4.35	5.86	5.27	4.29	2.76	7.21	4.30	3.74	4.20
Post Fiscal Year 2002 Benchmark	-3.13	6.04	6.25	2.65	3.58	5.98	4.84	2.96	4.18

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Dynamic Benchmark	-3.42	6.79	6.95	2.54	4.66	5.32	5.25	3.14	4.55
PBGC Total Fund Return Net Investment Expenses	-	-	-	2.8	-	-	-	3.20	-
Annualized standard deviation (percentage)									
S&P 500	13.28%	16.47%	13.43%	16.17%	14.71%	16.14%	15.10%	15.67%	15.33%
Barclays Capital Long-Term Government Credit Index	7.23	12.74	7.44	9.47	12.23	7.63	7.38	10.05	9.87
Wilshire 5000	14.18	16.87	13.68	16.53	15.29	16.30	15.42	15.92	15.67
PBGC Total Fund Return	6.12	10.99	8.39	7.99	9.69	10.17	7.90	8.01	8.98
PPA	9.80	12.42	9.68	10.60	11.77	10.95	10.14	10.43	10.92
Insurance Benchmark	7.39	11.82	7.39	8.52	11.51	7.54	7.13	8.99	9.26
Post Fiscal Year 2002 Benchmark	7.27	10.28	7.15	7.66	10.04	7.55	7.01	7.85	8.40
Dynamic Benchmark	7.51	12.21	8.04	8.48	11.13	9.89	8.01	8.57	9.59
PBGC Total Fund Return Net Investment Expenses.	-	-	-	7.98	-	-	-	8.01	-
Sharpe ratio (annualized)									
S&P 500	-0.02	0.59	0.97	-0.12	0.57	0.28	0.61	0.10	0.41
Barclays Capital Long-Term Government Credit Index	-0.70	0.41	0.52	0.57	0.14	1.01	0.46	0.41	0.39
Wilshire 5000	0.30	0.55	0.92	-0.06	0.62	0.29	0.55	0.17	0.43
PBGC Total Fund Return	-0.26	0.44	0.88	0.37	0.37	0.62	0.64	0.41	0.49
PPA	-0.22	0.64	0.97	0.09	0.49	0.53	0.68	0.25	0.48

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Insurance Benchmark	-0.59	0.50	0.71	0.50	0.24	0.96	0.60	0.42	0.45
Post Fiscal Year 2002 Benchmark	-0.43	0.59	0.87	0.35	0.36	0.79	0.69	0.38	0.50
Dynamic Benchmark	-0.46	0.56	0.86	0.30	0.42	0.54	0.66	0.37	0.47
PBGC Total Fund Return Net Investment Expenses.	-	-	-	0.36	-	-	-	0.40	-
Sortino ratio (annualized)									
S&P 500	-0.03	0.89	1.56	-0.16	0.95	0.38	0.90	0.14	0.59
Barclays Capital Long-Term Government Credit Index	-0.76	0.66	0.82	0.89	0.22	1.75	0.73	0.62	0.60
Wilshire 5000	0.45	0.80	1.43	-0.08	0.99	0.39	0.77	0.23	0.60
PBGC Total Fund Return	-0.31	0.65	1.47	0.52	0.59	0.88	1.02	0.58	0.73
PPA	-0.29	1.05	1.58	0.12	0.80	0.79	1.05	0.34	0.73
Insurance Benchmark	-0.65	0.83	1.15	0.76	0.37	1.61	0.98	0.61	0.71
Post Fiscal Year 2002 Benchmark	-0.51	1.01	1.43	0.49	0.57	1.30	1.11	0.53	0.77
Dynamic Benchmark	-0.52	0.89	1.38	0.43	0.68	0.75	1.05	0.52	0.72
PBGC Total Fund Return Net Investment Expenses	-	-	-	0.51	-	-	-	0.57	-

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Omega ratio									
S&P 500	0.98	1.58	2.03	0.91	1.53	1.26	1.55	1.09	1.36
Barclays Capital Long-Term Government Credit Index	0.55	1.36	1.47	1.56	1.12	2.11	1.40	1.37	1.35
Wilshire 5000	1.26	1.52	1.95	0.96	1.57	1.28	1.47	1.14	1.38
PBGC Total Fund Return	0.79	1.39	1.92	1.32	1.33	1.67	1.58	1.38	1.46
PPA	0.84	1.61	2.02	1.07	1.44	1.51	1.61	1.23	1.44
Insurance Benchmark	0.61	1.44	1.72	1.48	1.20	2.01	1.57	1.38	1.42
Post Fiscal Year 2002 Benchmark	0.71	1.53	1.91	1.31	1.31	1.78	1.64	1.35	1.46
Dynamic Benchmark	0.69	1.51	1.90	1.27	1.38	1.54	1.59	1.35	1.44
PBGC Total Fund Return Net Investment Expenses	-	-	1.91	1.32	-	-	1.20	1.37	1.33
Skewness, bias corrected									
S&P 500	-0.14	-0.81	-0.63	-0.59	0.16	-1.44	-0.72	-0.86	-0.66
Barclays Capital Long-Term Government Credit Index	-2.05	0.42	-0.07	-0.03	0.47	-0.10	-0.05	0.07	0.28
Wilshire 5000	-0.50	-0.98	-0.77	-0.71	-0.08	-1.74	-0.90	-0.90	-0.81
PBGC Total Fund Return	-1.72	-0.48	-0.03	-0.68	0.30	-1.37	-0.17	-0.86	-0.37
PPA	-0.58	-0.03	-0.38	-0.91	0.22	-0.57	-0.45	-1.22	-0.34
Insurance Benchmark	-1.77	0.43	-0.11	-0.40	0.44	-0.20	-0.05	-0.37	0.18
Post Fiscal Year 2002 Benchmark	-1.22	0.40	-0.18	-0.88	0.37	-0.10	-0.15	-1.02	0.01

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Dynamic Benchmark	-1.57	-0.04	-0.33	-0.58	0.37	-1.19	-0.16	-0.76	-0.15
PBGC Total Fund Return Net Investment Expenses	-	-	-0.14	-0.68	-	-	0.14	-0.86	-0.69
Kurtosis, bias corrected									
S&P 500	2.94	7.19	4.77	3.92	3.38	9.68	3.78	4.77	5.25
Barclays Capital Long-Term Government Credit Index	11.13	3.94	3.32	6.08	4.77	2.87	3.50	5.79	5.52
Wilshire 5000	3.50	7.73	5.18	3.95	3.51	11.05	4.21	4.90	5.59
PBGC Total Fund Return	8.83	5.83	3.69	5.69	3.72	9.94	2.86	6.48	5.86
PPA	3.67	3.52	3.77	5.50	3.26	5.03	2.78	6.71	4.33
Insurance Benchmark	9.21	3.67	3.59	6.31	4.36	3.10	3.52	6.10	5.22
Post Fiscal Year 2002 Benchmark	6.12	3.12	3.60	6.52	3.76	3.25	2.83	6.96	4.63
Dynamic Benchmark	7.79	4.05	3.66	6.27	3.93	7.13	2.69	6.99	5.17
PBGC Total Fund Return Net Investment Expenses	-	-	0.12	5.70	-	-	2.08	6.49	5.79
Adjusted Sharpe ratio									
S&P 500	-0.000391	0.594592	0.971118	-0.003190	0.573375	0.284191	0.613704	0.104676	0.407141
Barclays Capital Long-Term Government Credit Index	-0.003668	0.405723	0.523549	0.569919	0.143676	1.005150	0.464111	0.408882	0.389147
Wilshire 5000	0.303767	0.545163	0.917169	-0.001629	0.615824	0.294435	0.545306	0.172705	0.425189
PBGC Total Fund Return	-0.000980	0.436005	0.877346	0.365748	0.371506	0.620555	0.644295	0.406838	0.487750
PPA	-0.002162	0.639563	0.969694	0.092031	0.489602	0.531411	0.683582	0.252058	0.483584

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Insurance Benchmark	-0.003219	0.496088	0.712917	0.503391	0.239720	0.955671	0.603150	0.416168	0.453526
Post Fiscal Year 2002 Benchmark	-0.002276	0.587099	0.874635	0.345584	0.356897	0.791796	0.689409	0.376953	0.497025
Dynamic Benchmark	-0.002567	0.556275	0.864437	0.299025	0.418946	0.537960	0.655910	0.366512	0.474242
PBGC Total Fund Return Net Investment Expenses.	-	-	-	0.358696	-	-	-	0.399521	-
Minimum (percentage)									
S&P 500	-8.72%	-21.54%	-14.46%	-16.80%	-9.72%	-21.54%	-14.46%	-16.80%	-21.54%
Barclays Capital Long-Term Government Credit Index	-8.84	-7.92	-4.48	-8.72	-8.84	-4.24	-4.48	-8.72	-8.84
Wilshire 5000	-10.71	-22.78	-15.57	-17.57	-12.14	-22.78	-15.57	-17.57	-22.78
PBGC Total Fund Return	-6.60	-13.18	-5.47	-9.33	-6.60	-13.18	-4.53	-9.33	-13.18
PPA	-7.38	-10.51	-7.56	-12.95	-7.38	-10.51	-7.56	-12.95	-12.95
Insurance Benchmark	-8.47	-6.73	-4.49	-8.61	-8.47	-4.49	-4.29	-8.61	-8.61
Post Fiscal Year 2002 Benchmark	-7.14	-4.65	-4.86	-9.33	-7.14	-4.86	-3.85	-9.33	-9.33
Dynamic Benchmark	-8.08	-11.40	-6.05	-10.03	-8.08	-11.40	-4.02	-10.03	-11.40
PBGC Total Fund Return Net Investment Expenses	-	-	-0.86	-9.34	-	-	-2.84	-9.34	-9.34

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Maximum (percentage)									
S&P 500	9.02%	13.47%	11.44%	9.78%	13.47%	11.44%	9.78%	9.57%	13.47%
Barclays Capital Long-Term Government Credit Index	3.22	14.16	7.25	11.23	14.16	6.03	7.25	11.23	14.16
Wilshire 5000	8.27	12.80	10.98	10.52	12.80	10.98	8.23	10.52	12.80
PBGC Total Fund Return	3.38	9.56	8.94	7.31	9.56	8.94	6.72	7.31	9.56
PPA	5.38	10.48	9.03	6.83	10.48	9.03	7.06	6.03	10.48
Insurance Benchmark	3.58	12.73	6.76	9.71	12.73	6.31	6.76	9.71	12.73
Post Fiscal Year 2002 Benchmark	3.65	10.01	6.71	7.06	10.01	6.71	5.85	7.06	10.01
Dynamic Benchmark	3.55	11.24	6.74	8.53	11.24	6.74	6.50	8.53	11.24
PBGC Total Fund Return Net Investment Expenses	-	-	2.26	7.30	-	-	4.54	7.30	7.30
Range (percentage)									
S&P 500	17.74%	35.00%	25.90%	26.58%	23.19%	32.97%	24.24%	26.37%	35.00%
Barclays Capital Long-Term Government Credit Index	12.06	22.08	11.73	19.95	23.00	10.27	11.73	19.95	23.00
Wilshire 5000	18.98	35.58	26.55	28.09	24.94	33.76	23.80	28.09	35.58
PBGC Total Fund Return	9.99	22.74	14.41	16.64	16.17	22.12	11.25	16.64	22.74
PPA	12.76	20.99	16.59	19.77	17.86	19.54	14.62	18.98	23.43
Insurance Benchmark	12.05	19.46	11.25	18.32	21.20	10.81	11.05	18.32	21.34
Post Fiscal Year 2002 Benchmark	10.79	14.67	11.57	16.39	17.15	11.57	9.71	16.39	19.34

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Dynamic Benchmark	11.63	22.65	12.80	18.56	19.32	18.14	10.52	18.56	22.65
PBGC Total Fund Return Net Investment Expenses	-	-	3.12	16.64	-	-	7.39	16.64	16.64
VaR (99% confidence level, 1 month horizon) (percentage)									
S&P 500	8.35%	9.54%	7.54%	10.80%	8.48%	9.99%	8.98%	10.20%	9.32%
Barclays Capital Long-Term Government Credit Index	4.69	7.43	4.28	5.69	7.37	4.02	4.28	6.23	5.86
Wilshire 5000	8.57	9.86	7.75	10.96	8.79	10.08	9.26	10.28	9.52
PBGC Total Fund Return	3.66	6.29	4.63	4.90	5.51	5.84	4.50	4.93	5.21
PPA	6.18	6.98	5.33	6.81	6.73	6.41	5.84	6.60	6.44
Insurance Benchmark	4.74	6.75	4.13	5.15	6.80	4.00	4.04	5.54	5.42
Post Fiscal Year 2002 Benchmark	4.55	5.71	3.89	4.70	5.75	4.11	3.92	4.84	4.84
Dynamic Benchmark	4.74	6.94	4.43	5.26	6.39	5.73	4.55	5.31	5.61
PBGC Total Fund Return Net Investment Expenses	-	-	-	4.90	-	-	-	4.93	-
Expected shortfall (99% confidence level, 1 month horizon) (percentage)									
S&P 500	9.65%	11.15%	8.86%	12.39%	9.92%	11.57%	10.45%	11.74%	10.82%
Barclays Capital Long-Term Government Credit Index	5.40	8.67	5.01	6.61	8.57	4.77	5.01	7.21	6.82
Wilshire 5000	9.96	11.51	9.09	12.58	10.29	11.68	10.77	11.84	11.05
PBGC Total Fund Return	4.25	7.36	5.45	5.68	6.46	6.83	5.27	5.71	6.09
PPA	7.14	8.19	6.27	7.85	7.88	7.48	6.83	7.62	7.51

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Insurance Benchmark	5.46	7.90	4.85	5.98	7.93	4.74	4.74	6.42	6.32
Post Fiscal Year 2002 Benchmark	5.27	6.71	4.59	5.45	6.73	4.85	4.60	5.61	5.67
Dynamic Benchmark	5.47	8.13	5.22	6.09	7.48	6.70	5.34	6.15	6.55
PBGC Total Fund Return Net Investment Expenses	-	-	-	5.68	-	-	-	5.71	-

Source: GAO analysis of PBGC data.

Asset-Only Comparison of the PBGC Total Fund Return Performance to the Dynamic Benchmark Return Performance

The results summarized in table 6 indicate that, over the particular historical period studied, the PBGC Total Fund outperformed the Dynamic Benchmark on a risk-adjusted basis, where risk is measured in terms of the volatility of month returns.[23] In particular, all risk adjusted measures (Sharpe, Adjusted Sharpe, Sortino, and Omega ratios) are slightly higher for the PBGC Total Fund than for the Dynamic Benchmark for the overall period. For those three decade subperiods where the Sharpe ratio is positive for the PBGC Total Fund (1980–1989, 1990–1999, and 2000–2009) the PBGC Total Fund outperformed the Dynamic Benchmark for two out of the three subperiods (1990–1999, and 2000–2009). In the sub-period where the Sharpe and Sortino ratios are negative, the Adjusted Sharpe measure for the PBGC Total Fund is greater than that of the Dynamic Benchmark, again indicating that the PBGC Total Fund outperformed the Dynamic Benchmark in that period.

Disaggregation of the PBGC Total Fund's return performance statistics reveals that PBGC Total Fund returns tended to underperform the Dynamic Benchmark returns on a risk-adjusted basis when the Total Fund's allocation to equities is higher, not lower. For instance, during allocation period 1—when the PBGC Total Fund equity allocation had an

[23]These qualifiers apply to all the results presented in this section.

upward trend and the fixed-income allocation had a downward trend—the PBGC Total Fund Sharpe ratio was below that of the Dynamic Benchmark. In contrast, the PBGC Total Fund outperformed the Dynamic Benchmark in terms of the Sharpe ratio in allocation period 2, when the total fund equity allocation was falling. Also, the average allocation to equities was lower in allocation regime 4 than it was in allocation period 3, and the PBGC Total Fund outperformed the Dynamic Benchmark in allocation period 4 but slightly underperformed the Dynamic Benchmark in allocation period 3. The Sortino and Omega ratios show similar (and more pronounced in the case of the Omega ratio) under- or over-performance patterns across the weight regimes, thus corroborating and affirming the Sharpe ratio results.

Looking more closely at potential sources of the under- or over-performance of the PBGC Total Fund returns versus the Dynamic Benchmark returns, a driver of the PBGC Total Fund's under- or over-performance appears to be the mean of the returns, inasmuch as the pattern of under- or over-performance in the risk-adjusted return metrics across decades matches that of the pattern of under- or over-performance in the mean. This holds whether one views the disaggregations by "decade" or by allocation period.

Asset-Only Assessment of the Effect of Fluctuations in the PBGC Total Fund's Asset Allocation upon PBGC Performance

According to our results, the Dynamic Benchmark outperformed every static benchmark except the PPA and the Post Fiscal Year 2002 Benchmark—the benchmark portfolio with composition that roughly reflects the PBGC Total Fund's portfolio allocation during allocation period 4—while the PBGC Total Fund outperformed all the same benchmarks the Dynamic Benchmark did as well as the PPA. In addition, another finding is that all of the static benchmarks that involve mixtures of fixed income and equity securities outperform those benchmarks that allocate all funds to either bonds or equities.

With regard to question of whether fluctuations in asset allocations had an adverse impact on PBGC Total Fund returns, the variable nature of the results precludes concluding that the time variation in asset allocations necessarily adversely impacted the PBGC Total Fund return performance. Both the PBGC Total Fund and the Dynamic Benchmark have fluctuating asset allocations, yet both have higher values for the risk-adjusted performance metrics—Sharpe, Adjusted Sharpe, Omega, and Sortino ratios—than the majority of the fixed allocation portfolios. On the other hand, there is one fixed-allocation benchmark—the Post Fiscal Year 2002 Benchmark portfolio—that, for the overall period, had risk-adjusted

performance metrics that were superior to both the PBGC Total Fund and the Dynamic Benchmark. However, even this fixed allocation portfolio is really based upon the PBGC Total Fund, for the portfolio weights for the Post Fiscal Year 2002 Benchmark portfolio are a stylized representation of the PBGC Total Fund weights over the course of allocation period 4. In addition, note that, despite having fluctuating asset allocations, the PBGC Total Fund has outperformed the Post Fiscal Year 2002 Benchmark—in the sense of having higher risk-adjusted performance measure values—over significant subperiods of time in the past. For instance, the PBGC Total Fund has performed better than the Post Fiscal Year 2002 Benchmark portfolio on a risk adjusted basis for two out of the four "decade" subperiods—that is, the subperiods 1990–1999 and 2000–2009 for a total of 20 years out of the 33 1/4 years from October 1976 to December 2009. Thus, when returns on assets are considered in isolation from the growth in the liabilities, we did not find strong support in the data to indicate that the variations in the PBGC asset allocations adversely impacted the PBGC Total Funds' performance.

Lack of diversification across asset classes appeared to have a more adverse impact on risk-adjusted performance. Additionally, the portfolios with 100 percent allocations to equities had some undesirable characteristics. Notably, out of the eight portfolios considered in the portfolio performance analysis, all the portfolios that represented a single asset class were among the bottom half of the portfolios in terms of the Sharpe ratio for the entire data sample, including the 100 percent fixed-income benchmark. The dominant contributing factor to their relatively weak risk-adjusted return performance is risk—all three had among the highest standard deviation and kurtosis scores for the entire historical sample period. The two portfolios that were 100 percent equities—the S&P 500 and the Wilshire 5000—had an additional undesirable feature: negative skewness. These two had the "most negative" skewness scores for the total sample period out of the eight portfolios. The combination of magnified negative skewness and kurtosis evident in the returns of the two equity benchmark portfolios is undesirable because it implies that investment in such portfolios has the potential to contribute of extreme negative returns. Although both equity portfolios have the highest average returns for the overall sample, the relatively low Sharpe ratio scores associated with them imply that they do not offer enough reward per unit of risk—that is, robust enough reward to risk trade-offs—to outperform those portfolios, both static and dynamic, that contain a diversified mix of both bonds and equities.

PBGC Single-Employer Total Fund Underperformed Benchmarks on an Asset-Liability Basis, and Fluctuations in Asset Allocations Did Not Adversely Impact Asset-Liability Performance

A two-way comparison of the PBGC Total Fund and the Dynamic Benchmark enabled us to evaluate PBGC Total Fund under- or over-performance associated with factors other than the PBGC Total Fund asset allocation. Next we examine the impact of fluctuations in the PBGC Total Fund's asset allocation in the asset-liability context.

Comparison of The PBGC Total Fund Return Performance to the Dynamic Benchmark Return Performance in the Asset-Liability Context

A comparison of the PBGC Total Fund net-of-liability return performance to the net-of-liability return performance of the Dynamic Benchmark indicates that the PBGC Total Fund portfolio underperforms the Dynamic Benchmark in risk-adjusted terms on an asset-liability basis. In contrast to the results for the asset-only analysis, the PBGC Total Fund had weaker performance than the Dynamic Benchmark in that its Adjusted Sharpe ratio was lower for the overall time period (October 1976 to December 2009).[24] Despite the switch in the performance rankings of the PBGC Total Fund and the Dynamic Benchmark, there are many similarities between the asset-liability performance analysis results and the asset-only performance analysis returns. The areas of similarity are as follows:

1. *Under- or over-performance pattern across "decade" and asset allocation periods*. The PBGC Total Fund underperformed the Dynamic Benchmark for two out of the four decade subperiods and two out of the four asset allocation regimes on a risk-adjusted, net-of-

[24]One factor that complicates the analyses in this section and the interpretation of the traditional Sharpe ratio is that all of the portfolios exhibit negative mean excess returns and hence negative Sharpe ratios for the overall time period and many subperiods. As mentioned in the performance statistics section, this renders the interpretation of the Sharpe ratio unclear. Thus, in executing portfolio performance comparison on a net-of-liability returns basis, greater emphasis is placed on the Adjusted Sharpe ratio, which is specifically designed to address this problem and provide logically consistent ranks to portfolios in a fashion that appropriately reflects the impact of risk aversion on portfolio choice and asset allocation decisions.

liability return basis, according to the Adjusted Sharpe ratio statistic values.

2. *Lack of materiality of investment expenses*. Deducting investment expenses from the PBGC Total Fund returns in the asset-liability context did not affect the performance ranking of the PBGC Total Fund relative to the Dynamic Benchmark on an Adjusted Sharpe ratio basis (in those periods for which investment expenses data were available).

3. *Tendency to perform relatively worse in regimes where equity asset allocation is greater or rising.* The PBGC Total Fund's relative performance has tended to be worse in asset allocations periods where there is an elevated or rising allocation to the equity asset class. For example, as in the asset-only analysis, the PBGC Total Fund returns, net of the liability returns, had an Adjusted Sharpe ratio below that of the Dynamic Benchmark in allocation period 1 (which was characterized by a rising allocations to the equity sector). Also, as in the asset-only case, the PBGC Total Fund underperformed the Dynamic Benchmark on a net of liability return basis in allocation period 3, according to the Adjusted Sharpe ratio scores. In allocation period 4, when the average allocation to equities in the PBGC Total Fund portfolio was lower than in allocation regime 3, the PBGC Total Fund had a higher Adjusted Sharpe ratio than the Dynamic Benchmark did. However, unlike the asset-only case, the PBGC Total Fund Adjusted Sharpe ratio was less than that of the Dynamic Benchmark in allocation period 2, when the PBGC Total Fund allocation to equities was falling and to bonds was rising. The similarity of the seemingly inverse relation between the PBGC Total Fund Adjusted Sharpe ratio value and the magnitude of the allocation to the equities asset class reinforces the impression that elevated allocations of the PBGC Total Fund to the equity asset class had adverse impact on PBGC Total Fund returns net of the liability returns in an asset-liability context as well as when the portfolio returns are considered in isolation from the liability returns in an asset-only context. However the patterns in the equity asset allocation and its relationship to performance should not be viewed as implying causality.[25]

4. *Mean excess return prominence as a driver of risk-adjusted performance metric values across subperiods*. In every sub-period and

[25]For example, this finding should not be interpreted as equity causing the underperformance.

asset allocation regime where the excess mean return (net of the liability return) for the PBGC Total Fund exceeded the excess mean return (net of the liability return) for the Dynamic Benchmark portfolio, the Adjusted Sharpe ratio for the PBGC Total Fund exceeded the Adjusted Sharpe ratio for the Dynamic Benchmark.

Given all of the similarities between the results of the performance comparisons in the asset-liability and asset-only contexts, the reason for the contrast between the PBGC Total Fund's underperformance of the Dynamic Benchmark in the asset-liability context and its outperformance in the asset-only context appears to be risk. In the asset-only performance comparison analysis, the PBGC Total Fund's riskiness—as measured by the standard deviation and semi-standard deviation of the returns—-was lower than that of the Dynamic Benchmark portfolio. However, in the asset-liability context, the results indicate that the PBGC Total Fund returns have greater standard deviation and semi-standard deviation values than the returns for the Dynamic Benchmark, suggesting that the PBGC Total Fund returns (net of the liability returns) are riskier and more volatile than the Dynamic Benchmark returns (net of the liability returns). One factor that likely played a role in elevating the PBGC Total Fund's riskiness above that of the Dynamic Benchmark is the correlation of the actual asset returns with the liability returns (not the correlation between the liability returns and the asset returns net of the liability returns). For the overall sample period, the PBGC Total Fund actual returns had lower correlation with the liability returns —both scaled by the funding ratio and unscaled—than the Dynamic Benchmark. Higher correlation makes it more likely that movements in the liability return are accompanied by movements in the asset portfolio return in the same direction and of similar magnitude. Such co-movement of the actual asset returns and the liability returns helps reduce the volatility of the asset returns net of the liability returns.

Lower correlation has the opposite effect of higher correlation—lower correlation reduces co-movement between asset returns and liability returns and thus elevates the riskiness of asset returns net of the liability returns. Thus, the extent to which the riskiness of the PBGC Total Fund exceeds the riskiness of the Dynamic Benchmark on a net-of-liability return basis probably reflects, at least in part, the extent to which the liability returns are less correlated with the PBGC Total Fund's actual returns than with the Dynamic Benchmark actual returns. However, the question of why the PBGC Total Fund would be less correlated with liability returns than the Dynamic Benchmark would require a more detailed investigation.

Assessment of the Effect of Fluctuations in the PBGC Total Fund's Asset Allocation upon PBGC Performance in the Asset-Liability Context

The results of comparing the performance measures of the PBGC Total Fund and the Dynamic Benchmark returns, net of the liability return, to the performance measures of the static portfolios are that the Dynamic Benchmark outperforms two out of the six static portfolios—the Post Fiscal Year 2002 Benchmark and the Barclays Capital Long-Term Government Credit Index—and is roughly tied in performance with the S&P 500. However, the PBGC Total Fund did not outperform any of the benchmarks. Moreover, two out of the three best-performing portfolios have significant allocations to bonds and equities versus representing only a single asset class.

In order to detect potential sources of underperformance, as measured by the Adjusted Sharpe measure, in the PBGC Total Fund and the Dynamic Benchmark, we conducted a detailed comparison of various performance metrics for these two portfolios to performance metrics for the PPA benchmark portfolio—the portfolio that had the highest Adjusted Sharpe measure for the overall October 1976 through December 2009 sample period and, by that measure, the best risk-adjusted performance. This detailed comparison suggests that a major source of the underperformance of the PBGC Total Fund and the Dynamic Benchmark relative to the PPA benchmark portfolio was weakness in the mean excess return, for both portfolios had lower mean excess returns for the overall sample period the mean excess return of the PPA benchmark portfolio. However, both the PBGC Total Fund and the Dynamic Benchmark portfolios appeared to be less risky than the PPA portfolio inasmuch as the returns on both portfolios had lower standard deviation and semi-standard deviation than the returns on the PPA portfolio. Thus, the primary immediate reason both portfolios have lower Adjusted Sharpe ratios than the PPA benchmark is that their returns (net of the liability return) had lower mean excess returns than the PPA benchmark return (net of the liability return) not because they were more risky than the PPA benchmark. One other feature of the results that underscores the extent to which both portfolios were less risky than the PPA benchmark on an asset-liability basis is that the returns (net of the liability return) for both portfolios had lower standard deviations than the return (net of the liability return) for the PPA benchmark for every decade sub-period in the case of the Dynamic Benchmark and for three out of the four decade subperiods in the case of the PBGC Total Fund.

Although the statistics clearly suggest that weakness in the mean excess return played a role in lowering the risk-adjusted performance of both the PBGC Total Fund and the Dynamic Benchmark portfolios, the evidence provided by the performance measures about whether the variation over

time in asset allocations associated with both portfolios necessarily lowered the risk-adjusted performance of their returns on a net-of-liability basis is less clear. For example, on the one hand, the Dynamic Benchmark has a lower Adjusted Sharpe ratio for the overall sample period—and by that metric, weaker risk-adjusted performance—than several static portfolios; however, on the other hand, it also outperforms other fixed allocation portfolios on an Adjusted Sharpe ratio basis, which suggests that fluctuations in asset allocations alone do not immediately imply underperformance on a risk-adjusted basis.

In general, the evidence from the performance metrics is too ambiguous to support the conclusion that the variation in the asset allocations inherent in the PBGC Total Fund and the Dynamic Benchmark portfolio necessarily lowered the risk-adjusted performance of the returns of both portfolios within the asset-liability analysis. Furthermore, there are subperiods where the returns (net of the liability returns) for both dynamic portfolios have higher Adjusted Sharpe ratios than the PPA benchmark, even though this portfolio had the highest Adjusted Sharpe ratio for the overall sample period. In particular, both the PBGC Total Fund and the Dynamic Benchmark have higher Adjusted Sharpe ratios than the PPA benchmark for two out of the four decade subperiods; also, the Adjusted Sharpe ratios for both portfolios exceed that of the PPA benchmark for one of the four asset allocation regimes, a period of 8 years. The lengths of time over which the PBGC Total Fund and the Dynamic Benchmark outperform, on a risk-adjusted basis, the best static portfolio over significant subperiods of the overall sample period does not indicate that the fluctuations in the asset allocations for the PBGC Total Fund and the Dynamic Benchmark alone are a preeminent source of weakness in the risk-adjusted performance of the returns for both portfolios in the asset-liability context.

This analysis has primarily (although not exclusively) focused on the comparison of the risk-adjusted performance of the two dynamic portfolios to the performance of the PPA benchmark, the static portfolio which had the strongest risk-adjusted performance. However, if the focus is expanded to include comparisons across all of the static and dynamic portfolios, another feature of the results emerges. That is, the influence of the correlation between the portfolio returns and the liability return on the riskiness and the risk-adjusted performance of the portfolio returns net of the liability return. This influence is emphasized in the results for the best three performing portfolios over the period studied—the PPA benchmark, the Wilshire 5000, and the Life Insurance Benchmark portfolio performance results. The PPA benchmark and the Life Insurance Benchmark both have adjusted Sharpe ratios that equal or exceed that of

the Wilshire 5000 for the overall sample period even though the mean excess return of the Wilshire 5000 for the overall sample period is 49 percent greater than that of the Life Insurance Benchmark and 31 percent greater than that of the PPA benchmark. Because both the PPA and the Life Insurance Benchmark have lower mean excess returns than the Wilshire 5000, the source of their strong adjusted Sharpe ratio performance in comparison to the Wilshire 5000 rests in the riskiness of the returns for those two portfolios (in comparison to the Wilshire 5000). As shown in table 7, both portfolios have distinctly lower standard deviations and semi-standard deviations—two measures of riskiness—than the Wilshire 5000. Specifically, the annualized standard deviation of the Life Insurance Benchmark returns is 49 percent less than that of the Wilshire 5000 returns, and the semi-standard deviation of the Life Insurance Benchmark portfolio returns is 46 percent less than the semi-standard deviation of the Wilshire 5000 returns. Similarly, the annualized standard deviation of the PPA benchmark returns is 32 percent less than the annualized standard deviation of the Wilshire 5000 returns, and the annualized semi-standard deviation of the PPA benchmark returns is 30 percent less than the semi-standard deviation of the Wilshire 5000 returns.

Table 7: Portfolio Performance Comparison Results, October 1976 through December 2009 (All Asset Returns Are Net of Liability Return)

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Total return (percentage)									
S&P 500	0.91%	-8.58%	180.45%	-57.30%	25.82%	-29.58%	106.13%	-39.51%	10.48%
Barclays Capital Long-Term Government Credit Index	-9.90	-48.61	3.18	-6.30	-38.10	-25.69	19.17	-18.32	-55.23
Wilshire 5000	17.78	-13.20	157.61	-54.11	43.89	-31.65	88.74	-34.89	20.86
PBGC Total Fund Return	-	-54.39	45.35	-24.12	-30.30	-34.56	43.69	-23.25	-49.70
PPA	-3.08	-23.02	94.73	-36.76	-2.06	-24.82	71.92	-27.42	-8.12
Insurance Benchmark (long-term government credit index)	-8.11	-42.23	22.15	-13.26	-29.95	-24.56	32.09	-19.42	-43.75
Post Fiscal Year 2002 Benchmark	-4.92	-39.89	35.36	-27.80	-23.01	-29.21	39.37	-26.46	-44.14
Dynamic Benchmark	-5.38	-36.34	46.66	-27.08	-15.54	-30.99	45.84	-24.21	-35.58
PBGC Total Fund Return Net Investment Expenses	-	-	-	-24.54	-	-	-	-23.62	-
Liability Return	9.46	182.07	109.95	127.23	130.53	95.94	80.03	81.12	1,372.95
Monthly mean (percentage)									
S&P 500	0.09%	0.06%	0.94%	-0.59%	0.27%	-0.34%	0.85%	-0.39%	0.14%
Barclays Capital Long-Term Government Credit Index	-0.25	-0.52	0.05	-0.03	-0.35	-0.34	0.19	-0.18	-0.17
Wilshire 5000	0.49	0.02	0.88	-0.52	0.38	-0.37	0.76	-0.31	0.16
PBGC Total Fund Return	0.02	-0.58	0.34	-0.20	-0.23	-0.49	0.39	-0.24	-0.13
PPA	-0.05	-0.15	0.60	-0.33	0.03	-0.31	0.60	-0.27	0.03

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Insurance Benchmark (long-term government credit index)	-0.20	-0.42	0.19	-0.10	-0.25	-0.32	0.30	-0.19	-0.12
Post Fiscal Year 2002 Benchmark	-0.11	-0.38	0.28	-0.24	-0.17	-0.41	0.36	-0.28	-0.11
Dynamic Benchmark	-0.12	-0.32	0.35	-0.23	-0.10	-0.43	0.41	-0.25	-0.07
PBGC Total Fund Return Net Investment Expenses	-	-	-	-0.21	-	-	-	-0.25	-
Liability Return	0.25	0.94	0.65	0.72	0.70	0.96	0.63	0.64	0.72
Monthly mean excess return (percentage)									
S&P 500	-0.50%	-0.64%	0.55%	-0.81%	-0.43%	-0.80%	0.46%	-0.57%	-0.32%
Barclays Capital Long-Term Government Credit Index	-0.84	-1.22	-0.34	-0.25	-1.04	-0.80	-0.20	-0.36	-0.62
Wilshire 5000	-0.10	-0.68	0.48	-0.74	-0.32	-0.83	0.37	-0.49	-0.29
PBGC Total Fund Return	-0.57	-1.28	-0.05	-0.42	-0.92	-0.95	-	-0.42	-0.58
PPA	-0.64	-0.85	0.20	-0.55	-0.67	-0.77	0.21	-0.46	-0.42
Insurance Benchmark (long-term government credit index)	-0.79	-1.12	-0.20	-0.32	-0.95	-0.78	-0.09	-0.37	-0.57
Post Fiscal Year 2002 Benchmark	-0.70	-1.08	-0.11	-0.46	-0.87	-0.87	-0.03	-0.46	-0.56
Dynamic Benchmark	-0.71	-1.02	-0.04	-0.46	-0.79	-0.89	0.02	-0.43	-0.52
PBGC Total Fund Return Net Investment Expenses	-	-	-	-0.43	-	-	-	-0.43	-
Liability Return	-0.34	0.24	0.25	0.50	-	0.50	0.24	0.46	0.27

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Monthly standard deviation (percentage)									
S&P 500	3.67%	5.13%	3.95%	5.01%	4.30%	5.26%	4.21%	4.97%	4.65%
Barclays Capital Long-Term Government Credit Index	1.82	3.11	2.16	2.32	2.36	3.72	1.22	2.49	2.50
Wilshire 5000	3.67	5.17	4.09	5.08	4.33	5.38	4.33	5.01	4.72
PBGC Total Fund Return	2.12	4.16	2.48	2.33	3.36	4.25	1.73	2.39	3.03
PPA	2.62	3.72	2.84	3.22	3.07	4.09	2.60	3.23	3.23
Insurance Benchmark (long-term government credit index)	1.86	3.01	2.15	2.18	2.34	3.61	1.25	2.32	2.43
Post Fiscal Year 2002 Benchmark	2.08	3.24	2.29	2.41	2.63	3.70	1.47	2.54	2.63
Dynamic Benchmark	1.93	3.58	2.41	2.45	2.72	4.04	1.79	2.51	2.79
PBGC Total Fund Return Net Investment Expenses	-	-	-	2.33	-	-	-	2.39	-
Liability Return	1.85	3.12	2.24	2.49	2.99	2.70	1.61	2.66	2.57
Annualized semi-standard deviation (semi-variance) (percentage)									
S&P 500	9.06%	14.37%	8.99%	14.46%	10.99%	15.09%	10.32%	14.15%	12.52%
Barclays Capital Long-Term Government Credit Index	6.24	9.70	4.39	6.60	7.49	9.58	3.36	7.18	7.12
Wilshire 5000	8.60	14.72	9.56	14.64	11.09	15.62	10.98	14.12	12.79
PBGC Total Fund Return	5.94	12.96	5.45	6.86	10.02	12.06	4.39	7.05	8.74
PPA	7.12	10.94	6.32	9.46	8.64	11.23	6.37	9.45	8.92

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Insurance Benchmark (long-term government credit index)	6.14	9.36	4.37	6.28	7.35	9.31	3.22	6.76	6.88
Post Fiscal Year 2002 Benchmark	6.13	9.94	4.79	7.22	7.92	9.76	3.76	7.59	7.46
Dynamic Benchmark	6.05	10.98	5.16	7.22	8.16	11.17	4.45	7.43	7.95
PBGC Total Fund Return Net Investment Expenses	0.00	0.00	0.39	6.88	0.00	0.00	2.80	7.06	3.78
Liability Return	6.00	7.33	5.80	5.06	7.44	6.99	3.57	5.45	6.12
Annualized arithmetic mean (percentage)									
S&P 500	1.06%	0.69%	11.28%	-7.03%	3.24%	-4.04%	10.14%	-4.63%	1.62%
Barclays Capital Long-Term Government Credit Index	-3.01	-6.22	0.58	-0.33	-4.16	-4.06	2.28	-2.10	-2.06
Wilshire 5000	5.83	0.19	10.50	-6.26	4.53	-4.44	9.10	-3.71	1.94
PBGC Total Fund Return	0.26	-6.98	4.10	-2.45	-2.71	-5.88	4.72	-2.89	-1.53
PPA	-0.56	-1.85	7.16	-3.99	0.36	-3.69	7.19	-3.28	0.37
Insurance Benchmark (long-term government credit index)	-2.40	-5.07	2.26	-1.14	-3.01	-3.86	3.58	-2.32	-1.39
Post Fiscal Year 2002 Benchmark	-1.30	-4.58	3.33	-2.93	-2.04	-4.87	4.28	-3.37	-1.35
Dynamic Benchmark	-1.48	-3.85	4.17	-2.82	-1.14	-5.12	4.91	-3.01	-0.87
PBGC Total Fund Return Net Investment Expenses	-	-	-	-2.51	-	-	-	-2.95	-
Liability Return	2.99	11.26	7.75	8.67	8.39	11.56	7.53	7.71	8.60

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Annualized mean excess return (percentage)									
S&P 500	-6.01%	-7.68%	6.58%	-9.67%	-5.10%	-9.58%	5.48%	-6.81%	-3.78%
Barclays Capital Long-Term Government Credit Index	-10.08	-14.60	-4.12	-2.98	-12.51	-9.60	-2.38	-4.28	-7.47
Wilshire 5000	-1.24	-8.18	5.80	-8.90	-3.82	-9.98	4.44	-5.89	-3.47
PBGC Total Fund Return	-6.81	-15.35	-0.60	-5.10	-11.05	-11.42	0.05	-5.07	-6.94
PPA	-7.63	-10.22	2.46	-6.63	-7.99	-9.23	2.53	-5.46	-5.03
Insurance Benchmark (long-term government credit index)	-9.46	-13.44	-2.43	-3.79	-11.36	-9.40	-1.09	-4.49	-6.80
Post Fiscal Year 2002 Benchmark	-8.37	-12.95	-1.37	-5.57	-10.39	-10.41	-0.38	-5.54	-6.76
Dynamic Benchmark	-8.55	-12.22	-0.53	-5.47	-9.49	-10.66	0.25	-5.18	-6.27
PBGC Total Fund Return Net Investment Expenses	-	-	-	-5.16	-	-	-	-5.13	-
Liability Return	-4.08	2.88	3.05	6.02	0.04	6.01	2.86	5.53	3.19
Annualized standard deviation (percentage)									
S&P 500	12.72%	17.77%	13.67%	17.35%	14.90%	18.23%	14.60%	17.20%	16.11%
Barclays Capital Long-Term Government Credit Index	6.30	10.78	7.49	8.05	8.19	12.88	4.24	8.61	8.66
Wilshire 5000	12.70	17.91	14.18	17.59	15.01	18.65	15.00	17.36	16.35
PBGC Total Fund Return	7.35	14.42	8.59	8.08	11.63	14.72	6.00	8.27	10.48
PPA	9.07	12.88	9.84	11.15	10.64	14.17	8.99	11.19	11.18

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Insurance Benchmark (long-term government credit index)	6.46	10.44	7.46	7.55	8.09	12.49	4.32	8.03	8.41
Post Fiscal Year 2002 Benchmark	7.20	11.24	7.93	8.36	9.10	12.83	5.09	8.79	9.11
Dynamic Benchmark	6.69	12.42	8.35	8.48	9.41	14.00	6.19	8.70	9.66
PBGC Total Fund Return Net Investment Expenses	-	-	-	8.08	-	-	-	8.27	-
Liability Return	6.41	10.82	7.75	8.62	10.37	9.37	5.59	9.21	8.90
Sharpe ratio (annualized)									
S&P 500	-0.47	-0.43	0.48	-0.56	-0.34	-0.53	0.38	-0.40	-0.23
Barclays Capital Long-Term Government Credit Index	-1.60	-1.35	-0.55	-0.37	-1.53	-0.75	-0.56	-0.50	-0.86
Wilshire 5000	-0.10	-0.46	0.41	-0.51	-0.25	-0.54	0.30	-0.34	-0.21
PBGC Total Fund Return	-0.93	-1.06	-0.07	-0.63	-0.95	-0.78	0.01	-0.61	-0.66
PPA	-0.84	-0.79	0.25	-0.59	-0.75	-0.65	0.28	-0.49	-0.45
Insurance Benchmark (long-term government credit index)	-1.47	-1.29	-0.33	-0.50	-1.40	-0.75	-0.25	-0.56	-0.81
Post Fiscal Year 2002 Benchmark	-1.16	-1.15	-0.17	-0.67	-1.14	-0.81	-0.08	-0.63	-0.74
Dynamic Benchmark	-1.28	-0.98	-0.06	-0.64	-1.01	-0.76	0.04	-0.60	-0.65
PBGC Total Fund Return Net Investment Expenses	-	-	-	-0.64	-	-	-	-0.62	-
Liability Return	-0.64	0.27	0.39	0.70	-	0.64	0.51	0.60	0.36

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Sortino ratio (annualized)									
S&P 500	-0.66	-0.53	0.73	-0.67	-0.46	-0.63	0.53	-0.48	-0.30
Barclays Capital Long-Term Government Credit Index	-1.62	-1.51	-0.94	-0.45	-1.67	-1.00	-0.71	-0.60	-1.05
Wilshire 5000	-0.14	-0.56	0.61	-0.61	-0.34	-0.64	0.40	-0.42	-0.27
PBGC Total Fund Return	-1.15	-1.18	-0.11	-0.74	-1.10	-0.95	0.01	-0.72	-0.79
PPA	-1.07	-0.93	0.39	-0.70	-0.92	-0.82	0.40	-0.58	-0.56
Insurance Benchmark (long-term government credit index)	-1.54	-1.44	-0.56	-0.60	-1.55	-1.01	-0.34	-0.66	-0.99
Post Fiscal Year 2002 Benchmark	-1.37	-1.30	-0.29	-0.77	-1.31	-1.07	-0.10	-0.73	-0.91
Dynamic Benchmark	-1.41	-1.11	-0.10	-0.76	-1.16	-0.95	0.06	-0.70	-0.79
PBGC Total Fund Return Net Investment Expenses	-	-	-	-0.75	-	-	-	-0.73	-
Liability Return	-0.68	0.39	0.53	1.19	0.01	0.86	0.80	1.02	0.52
Omega ratio									
S&P 500	0.71	0.71	1.44	0.66	0.78	0.64	1.32	0.74	0.84
Barclays Capital Long-Term Government Credit Index	0.22	0.31	0.56	0.70	0.30	0.43	0.66	0.62	0.44
Wilshire 5000	0.93	0.70	1.36	0.69	0.83	0.64	1.25	0.78	0.85
PBGC Total Fund Return	0.48	0.43	0.94	0.60	0.48	0.46	1.01	0.60	0.57
PPA	0.54	0.54	1.22	0.64	0.58	0.56	1.23	0.69	0.71

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Insurance Benchmark (long-term government credit index)	0.27	0.33	0.71	0.62	0.33	0.43	0.83	0.58	0.47
Post Fiscal Year 2002 Benchmark	0.39	0.39	0.85	0.58	0.42	0.43	0.95	0.59	0.53
Dynamic Benchmark	0.34	0.45	0.94	0.60	0.47	0.46	1.03	0.61	0.58
PBGC Total Fund Return Net Investment Expenses.	-	-	2.69	0.60	-	-	0.75	0.60	0.62
Liability Return	0.53	1.23	1.40	1.79	1.00	1.74	1.46	1.65	1.35
Skewness, bias corrected									
S&P 500	0.64	-0.62	-0.26	-0.42	0.38	-0.83	-0.70	-0.64	-0.48
Barclays Capital Long-Term Government Credit Index	-0.39	-0.18	4.35	-1.16	0.79	0.85	0.02	-1.00	0.36
Wilshire 5000	0.26	-0.76	-0.31	-0.48	0.22	-0.93	-0.88	-0.64	-0.59
PBGC Total Fund Return	0.56	-0.28	2.05	-0.79	0.09	0.20	-0.22	-0.91	-0.12
PPA	0.55	-0.19	0.81	-0.52	0.36	0.35	-0.50	-0.73	-0.09
Insurance Benchmark (long-term government credit index)	-0.18	-0.13	3.80	-1.18	0.61	0.99	-0.01	-1.11	0.38
Post Fiscal Year 2002 Benchmark	0.52	0.01	3.13	-0.94	0.44	1.17	-0.16	-0.99	0.35
Dynamic Benchmark	0.02	-0.35	2.31	-0.75	0.20	0.48	-0.19	-0.90	0.01
PBGC Total Fund Return Net Investment Expenses	-	-	0.37	-0.79	-	-	0.07	-0.91	-0.80
Liability Return	-2.98	0.05	-2.08	0.32	0.02	-2.22	-0.09	0.40	-0.33

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Kurtosis, bias corrected									
S&P 500	2.83	6.16	5.55	2.98	3.29	8.04	4.22	3.28	4.91
Barclays Capital Long-Term Government Credit Index	7.20	10.45	37.44	9.35	5.16	15.11	2.65	8.44	15.80
Wilshire 5000	2.55	6.77	6.10	2.97	3.27	8.75	4.63	3.32	5.26
PBGC Total Fund Return	5.02	4.45	19.99	5.55	3.65	8.93	2.78	5.86	8.37
PPA	3.18	4.95	9.89	2.89	3.36	7.83	3.42	3.08	5.48
Insurance Benchmark (long-term government credit index)	6.44	9.71	33.53	9.10	4.62	14.64	2.92	8.47	15.08
Post Fiscal Year 2002 Benchmark	5.67	6.53	28.55	5.80	4.08	12.77	2.72	5.65	10.99
Dynamic Benchmark	5.83	5.65	21.09	5.15	3.60	9.69	2.97	5.36	9.33
PBGC Total Fund Return Net Investment Expenses	-	-	0.12	5.56	-	-	2.29	5.87	5.60
Liability Return	17.74	4.20	16.27	6.39	5.23	14.03	3.19	6.00	7.57
Adjusted Sharpe ratio									
S&P 500	-0.0076	-0.0137	0.4818	-0.0168	-0.0076	-0.0175	0.3753	-0.0117	-0.0061
Barclays Capital Long-Term Government Credit Index	-0.0063	-0.0157	-0.0031	-0.0024	-0.0102	-0.0124	-0.0010	-0.0037	-0.0065
Wilshire 5000	-0.0016	-0.0146	0.4092	-0.0157	-0.0057	-0.0186	0.2957	-0.0102	-0.0057
PBGC Total Fund Return	-0.0050	-0.0221	-0.0005	-0.0041	-0.0129	-0.0168	0.0083	-0.0042	-0.0073
PPA	-0.0069	-0.0132	0.2494	-0.0074	-0.0085	-0.0131	0.2809	-0.0061	-0.0056

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Insurance Benchmark (long-term government credit index)	-0.0061	-0.0140	-0.0018	-0.0029	-0.0092	-0.0118	-0.0005	-0.0036	-0.0057
Post Fiscal Year 2002 Benchmark	-0.0060	-0.0146	-0.0011	-0.0047	-0.0095	-0.0134	-0.0002	-0.0049	-0.0062
Dynamic Benchmark	-0.0057	-0.0152	-0.0004	-0.0046	-0.0089	-0.0149	0.0400	-0.0045	-0.0061
PBGC Total Fund Return Net Investment Expenses	-	-	-	-0.0042	-	-	-	-0.0042	-
Liability Return	-0.0026	0.2666	0.3931	0.6986	0.0037	0.6419	0.5118	0.6009	0.3585
Minimum (percentage)									
S&P 500	-5.25%	-23.13%	-14.82%	-15.34%	-9.72%	-23.13%	-14.82%	-15.34%	-23.13%
Barclays Capital Long-Term Government Credit Index	-5.47	-16.25	-5.78	-9.33	-6.06	-16.25	-3.09	-9.33	-16.25
Wilshire 5000	-7.29	-24.42	-15.96	-16.13	-10.31	-24.42	-15.96	-16.13	-24.42
PBGC Total Fund Return	-4.91	-15.34	-8.31	-8.69	-9.90	-15.34	-3.61	-8.69	-15.34
PPA	-5.29	-12.39	-8.22	-8.42	-7.07	-12.39	-8.01	-8.42	-12.39
Insurance Benchmark (long-term government credit index)	-5.35	-15.09	-6.16	-8.76	-6.10	-15.09	-3.04	-8.76	-15.09
Post Fiscal Year 2002 Benchmark	-5.21	-13.76	-6.98	-9.05	-6.97	-13.76	-3.19	-9.05	-13.76
Dynamic Benchmark	-5.29	-13.36	-7.68	-8.74	-7.20	-13.36	-4.56	-8.74	-13.36
PBGC Total Fund Return Net Investment Expenses	-	-	-0.78	-8.70	-	-	-3.27	-8.70	-8.70
Liability Return	-8.78	-8.86	-13.57	-8.14	-8.86	-13.57	-3.62	-8.14	-13.57

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Maximum (percentage)									
S&P 500	9.72%	13.44%	15.43%	9.80%	13.44%	15.43%	9.45%	9.80%	15.43%
Barclays Capital Long-Term Government Credit Index	5.49	12.17	17.18	7.45	8.67	17.18	2.83	7.45	17.18
Wilshire 5000	8.92	13.42	16.54	9.80	13.42	16.54	8.74	9.80	16.54
PBGC Total Fund Return	6.90	11.72	16.74	6.32	10.22	16.74	4.16	6.32	16.74
PPA	6.20	11.95	15.90	6.37	9.59	15.90	6.37	5.45	15.90
Insurance Benchmark (long-term government credit index)	5.65	12.06	16.81	6.71	7.55	16.81	3.31	6.71	16.81
Post Fiscal Year 2002 Benchmark	6.70	11.90	17.23	6.00	8.53	17.23	3.80	6.00	17.23
Dynamic Benchmark	5.87	12.12	16.72	6.09	8.01	16.72	4.88	6.09	16.72
PBGC Total Fund Return Net Investment Expenses	-	-	2.77	6.31	-	-	4.15	6.31	6.31
Liability Return	2.81	10.72	6.71	9.42	10.72	6.71	5.34	9.42	10.72
Range (percentage)									
S&P 500	14.97%	36.57%	30.25%	25.14%	23.16%	38.56%	24.26%	25.14%	38.56%
Barclays Capital Long-Term Government Credit Index	10.95	28.42	22.96	16.78	14.74	33.43	5.92	16.78	33.43
Wilshire 5000	16.21	37.84	32.50	25.93	23.73	40.96	24.70	25.93	40.96
PBGC Total Fund Return	11.81	27.06	25.05	15.01	20.12	32.08	7.77	15.01	32.08
PPA	11.49	24.34	24.12	14.80	16.66	28.29	14.38	13.88	28.29

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Insurance Benchmark (long-term government credit index)	11.00	27.16	22.97	15.47	13.65	31.90	6.35	15.47	31.90
Post Fiscal Year 2002 Benchmark	11.91	25.65	24.20	15.06	15.51	30.98	6.99	15.06	30.98
Dynamic Benchmark	11.16	25.49	24.40	14.83	15.22	30.09	9.44	14.83	30.09
PBGC Total Fund Return Net Investment Expenses	-	-	3.54	15.00	-	-	7.42	15.0	15.00
Liability Return	11.58	19.59	20.28	17.56	19.59	20.28	8.95	17.56	24.30
Correlation with liability return									
S&P 500	0.43	0.35	0.29	0.12	0.46	0.19	0.20	0.14	0.27
Barclays Capital Long-Term Government Credit Index	0.80	0.84	0.63	0.72	0.90	0.39	0.83	0.71	0.76
Wilshire 5000	0.47	0.35	0.25	0.14	0.45	0.17	0.19	0.15	0.27
PBGC Total Fund Return	0.70	0.60	0.53	0.63	0.73	0.27	0.63	0.67	0.59
PPA	0.58	0.63	0.44	0.37	0.72	0.27	0.42	0.40	0.50
Insurance Benchmark (long-term government credit index)	0.78	0.85	0.62	0.71	0.91	0.39	0.80	0.71	0.76
Post Fiscal Year 2002 Benchmark	0.71	0.80	0.56	0.61	0.86	0.36	0.66	0.63	0.68
Dynamic Benchmark	0.75	0.71	0.53	0.60	0.84	0.27	0.61	0.63	0.64
PBGC Total Fund Return Net Investment Expenses	-	-	-	0.63	-	-	-	0.67	-
Liability Return	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Correlation with liability return scaled by funding ratio									
S&P 500	0.44	0.37	0.26	0.17	0.48	0.17	0.26	0.18	0.29
Barclays Capital Long-Term Government Credit Index	0.82	0.82	0.58	0.67	0.90	0.36	0.84	0.68	0.74
Wilshire 5000	0.49	0.37	0.23	0.18	0.48	0.16	0.23	0.19	0.29
PBGC Total Fund Return	0.70	0.58	0.49	0.62	0.72	0.25	0.66	0.67	0.57
PPA	0.60	0.62	0.39	0.39	0.73	0.25	0.47	0.42	0.51
Insurance Benchmark (long-term government credit index)	0.80	0.82	0.57	0.68	0.90	0.36	0.82	0.69	0.74
Post Fiscal Year 2002 Benchmark	0.73	0.77	0.51	0.60	0.86	0.33	0.69	0.63	0.68
Dynamic Benchmark	0.77	0.69	0.48	0.60	0.83	0.25	0.64	0.64	0.64
PBGC Total Fund Return Net Investment Expenses.	-	-	-	0.62	-	-	-	0.66	-
VaR (99% confidence level, 1 month horizon) (percentage)									
S&P 500	8.45%	11.88%	8.24%	12.23%	9.74%	12.58%	8.96%	11.94%	10.68%
Barclays Capital Long-Term Government Credit Index	4.48	7.76	4.98	5.43	5.84	8.99	2.66	5.96	5.99
Wilshire 5000	8.05	12.01	8.65	12.34	9.71	12.89	9.31	11.97	10.82
PBGC Total Fund Return	4.91	10.26	5.43	5.63	8.03	10.37	3.63	5.80	7.17
PPA	6.13	8.80	6.01	7.82	7.11	9.83	5.44	7.79	7.48

	October 1976 through December 1979	1980–1989	1990–1999	2000–2009	September 1976 through August 1987	September 1987 through September 1993	October 1993 through October 2001	November 2001 through December 2009	All (October 1976 through December 2009)
Insurance Benchmark (long-term government credit index)	4.53	7.43	4.82	5.17	5.69	8.71	2.60	5.59	5.76
Post Fiscal Year 2002 Benchmark	4.94	7.93	5.05	5.86	6.28	9.02	3.06	6.18	6.23
Dynamic Benchmark	4.61	8.66	5.26	5.93	6.41	9.83	3.75	6.09	6.56
PBGC Total Fund Return Net Investment Expenses	-	-	-	5.64	-	-	-	5.80	-
Liability Return	4.06	6.33	4.56	5.07	6.26	5.33	3.12	5.54	5.26
Expected shortfall (99% confidence level, 1 month horizon) (percentage)									
S&P 500	9.70%	13.62%	9.58%	13.93%	11.19%	14.36%	10.38%	13.62%	12.26%
Barclays Capital Long-Term Government Credit Index	5.10	8.81	5.71	6.22	6.64	10.25	3.07	6.80	6.84
Wilshire 5000	9.29	13.76	10.03	14.06	11.18	14.72	10.78	13.67	12.41
PBGC Total Fund Return	5.63	11.67	6.27	6.42	9.17	11.81	4.22	6.61	8.19
PPA	7.02	10.06	6.98	8.91	8.15	11.21	6.32	8.89	8.57
Insurance Benchmark (long-term government credit index)	5.17	8.45	5.55	5.91	6.48	9.93	3.02	6.37	6.59
Post Fiscal Year 2002 Benchmark	5.64	9.03	5.82	6.68	7.17	10.27	3.56	7.04	7.12
Dynamic Benchmark	5.27	9.87	6.08	6.76	7.33	11.19	4.35	6.94	7.50
PBGC Total Fund Return Net Investment Expenses	-	-	-	6.43	-	-	-	6.61	-
Liability Return	4.68	7.39	5.32	5.91	7.28	6.25	3.67	6.44	6.13

Source: GAO analysis of PBGC data.

By examining the correlation of the PPA benchmark, the Life Insurance Benchmark, and the Wilshire 5000 returns with the liability return in conjunction with the standard deviation values for the returns on those three portfolios, one can observe the potential role of the correlation in reducing the riskiness of the PPA and Life Insurance Benchmark return (net of the liability returns). In particular, the correlation of the returns on both the PPA and Life Insurance Benchmark portfolios with the liability return are distinctly higher than the correlation of the return on the Wilshire 5000 with the liability return. As shown in table 7, the correlation of the Wilshire 5000 return with the scaled liability return is 0.29, but the analogous correlation statistic for the PPA benchmark return is 0.51 (76 percent higher than the Wilshire 5000 correlation statistic) and for the Life Insurance Benchmark portfolio is 0.74 (155 percent higher than the Wilshire 5000 correlation statistic). Furthermore, it appears that, the higher the correlation, the lower the risk, since the benchmark portfolio that has returns with the highest correlation with the liability return—the Life Insurance Benchmark—has the least risk. When considering all eight portfolios being studied (instead of only the three portfolios with the strongest risk-adjusted performance), the four portfolios with the highest correlations with the liability return have the four lowest standard deviations, and the four portfolios with the lowest correlations have the four highest standard deviation estimates. Also, with the exception of the two portfolios with the highest correlation scores and lowest standard deviation values, the rankings of the standard deviation values matches the rankings of the correlation estimates (in ascending order by standard deviation and descending order by correlation). The strong relation between extent of correlation with the liability return and risk highlights how the relatively strong correlation of the PPA and the Life Insurance Benchmark returns with the liability return seems to contribute to lowering the riskiness of the returns (net of the liability return) of these two portfolios, enhancing their Adjusted Sharpe ratio values and risk-adjusted performance (according to the Adjusted Sharpe ratio statistic).

The apparent linkage between the risk-adjusted performance metric and the correlation between the actual portfolio return and the liability return is most likely a reflection of the effect of the correlation between the actual portfolio returns and the liability returns on the volatility of the portfolio returns net of the liability return. As was discussed in the comparison between the performance of the PBGC Total Fund and the Dynamic Benchmark, higher correlation between the (actual) portfolio returns and the liability returns implies a greater degree of co-movement between the asset returns and the liability returns, and greater co-movement between the asset returns and the liability returns weakens or

lowers the volatility of the portfolio returns net of the liability return. One reflection of the lowered volatility for the portfolio returns net of the liability return is a lowered standard deviation value, and a lower standard deviation value helps elevate the Adjusted Sharpe ratio value, implying stronger risk-adjusted performance.

The strong relation between the correlation statistic and the Adjusted Sharpe measure values provide at least a partial explanation of why two out of the three portfolios that have the best risk-adjusted performance (as indicated by their Adjusted Sharpe ratio scores) all have allocations to the bond asset class sector of 40 percent or more. The portfolio of the liabilities consists mostly of annuities and annuity-like instruments, all of which are obligations of the PBGC. To the extent that annuities are fixed-income contracts, the portfolio of liabilities is essentially bond-like in nature. Hence, the fact that the asset portfolios that have a significant allocation to bonds have return behavior that is more similar to, and thus would have higher correlation with, the liability returns is not surprising.

Among the three portfolios that have the returns with the strongest risk-adjusted performance, the returns for the two portfolios that have the highest allocation to bonds (the PPA benchmark and the Life Insurance Benchmark) also have other desirable characteristics. For instance, these two portfolios (as opposed to the Wilshire 5000) have returns which, net of the liability return, have higher skewness for the overall sample than the Wilshire 5000. The higher skewness of the returns for the PPA benchmark and the Life Insurance Benchmark portfolios suggests that those portfolios are less likely to have months where the return on the asset portfolio falls extremely short of the growth in the PBGC liabilities than the Wilshire 5000. Minimization of the instances where the asset returns fall extremely short of the liability returns would help prevent further growth of the already sizeable PBGC funding deficit.

The desirable implications of the higher skewness can be seen through other statistics. Note that the minimum values for the PPA Benchmark and the Life Insurance Benchmark portfolios are less extreme. That is, they are less negative than for the Wilshire 5000. To get a sense of how much "less extreme" they are, note that the minimum monthly net-of-liability return for the PPA Benchmark is negative 12.39 percent and for the Life Insurance Benchmark is negative 15.09 percent in contrast to the minimum negative return value for the Wilshire 5000 of negative 24.42 percent. Because returns on the two highest-performing benchmark portfolios with significant allocations to bonds—the PPA Benchmark and the Insurance Benchmark portfolios—have less extreme negative values,

lower semi-standard deviations, and lower standard deviations than the returns on Wilshire 5000, there is a strong possibility that the probability distributions associated with these returns have assign less probability to on extreme negative values than the probability distribution associated with the Wilshire 5000 returns, characteristics that are consistent with and are associated with the PPA and Life Insurance Benchmark portfolio returns having skewness statistic estimates that exceed the (negative) skewness statistic for the Wilshire 5000 returns.

The fact that the three best performing portfolios over the 1976 through 2009 period in this particular analysis were the PPA benchmark, the Wilshire 5000, and the Life Insurance Benchmark does not necessarily mean that any of these portfolios would be appropriate for the PBGC going forward. The results of any particular analysis will depend on the performance statistics used and how these performance statistics balance risk and reward, and criteria would also need to be established for meaningful differences in these measurements. Also, as noted earlier, an asset allocation exercise would look at multiple possible future scenarios, not one particular historical period. High allocation to equities would be a particularly controversial matter for the PBGC because of the lower, and potentially, negative correlation between equity returns and new claims. The various alternative static portfolios used in this report were analyzed for the purpose of a "what-if" analysis—a historical comparison of alternative investment strategies versus the fluctuating asset allocation that the PBGC actually employed; they were not for the purpose of recommending a particular static asset allocation going forward.

Appendix IV: Comments from the Department of Labor

SECRETARY OF LABOR
WASHINGTON, D.C. 20210

JUN 14 2011

Mr. Gene Dodaro
Comptroller General
United States Government
Accountability Office
Washington, DC 20548

Dear Mr. Dodaro:

I am responding on behalf of the Pension Benefit Guaranty Corporation (PBGC) Board to your request for comments on the Government Accountability Office's (GAO) draft report entitled "Pension Benefit Guaranty Corporation: Asset Management Needs Better Stewardship" (GAO-11-271).

My fellow Board members and I take our governance responsibilities of the PBGC and oversight of the investment policy seriously. Following more than a year of review, the PBGC Board approved a new Investment Policy Statement in May 2011 (Policy). For the first time, a PBGC investment policy statement is available to the public on the PBGC web site. The Board is working with the PBGC Director and staff to ensure the effective implementation of the Policy.

The Board undertook a comprehensive review of the investment policy, including extensive consultation and analysis. During the course of this review, the Board sought advice from the PBGC Advisory Committee, outside investment advisors and consultants, academicians, the business and labor community, and the PBGC Director and staff. The PBGC also conducted comprehensive analyses of the impact of a range of economic, portfolio and demographic risks on PBGC's liabilities, including an analysis by the Corporation's investment consultant.

The Policy governs the total fund and represents broad consensus among the three Board agencies. The Policy includes an investment objective to maximize total return within a prudent risk framework that is informed by PBGC's fixed obligations and asset composition of potential trusteed plans. The elements of the Policy are consistent with standards followed by institutional investors and represent a systematic approach to documenting objectives, constraints, risk tolerance, rebalancing, Board monitoring, and governance mechanisms necessary to implement the Policy.

The Policy requires that the Board Representatives approve target allocations and permitted ranges for sub-asset classes. PBGC staff is preparing recommendations for the Board Representatives so they can discuss options in order to fulfill this responsibility. Supplemental policy guidance regarding sub-asset class allocations and rebalancing guidelines will follow, as well as other policy guidance related to risk metrics, tolerances and management. In addition, in support of the policy objectives we anticipate more frequent analyses of PBGC's assets and liabilities.

Consistent with the Corporation's bylaws, the Board will continue to review the investment policy statement at least every two years and approve the investment policy statement at least every four years. The Policy does not require that a new investment policy be adopted every four years or sooner but it does require the Board to consider whether the policy should be affirmed or revised. We believe the bylaws set an appropriate review schedule and are consistent with prudent governance practices.

We concur with both recommendations in your report. Actions taken by this Board are consistent with institutional investor best practices and with the two recommendations contained in the report. The Policy adopted by the Board in May 2011 carries out the recommendations in your report. The Policy establishes clear organizational accountabilities governing the various entities that work on behalf of the PBGC, and provides well-defined goals and risk management parameters.

With specific regard to our oversight of the investment policy and its implementation, the Board has undertaken a number of actions since the start of the Administration, including the following activities.

- In early 2009, the PBGC Office of Inspector General brought to the Board's attention serious concerns related to the implementation of the investment policy. While these issues were being reviewed, and in light of the Board's intent to review the PBGC Investment Policy Statement, the Board unanimously approved Resolution 2009-06 directing the PBGC to cease further activity to implement the 2008 investment policy.

- Following our adoption of Resolution 2009-06, the Board Representatives, acting in accordance with the authority given to them under the PBGC bylaws, provided written guidance in July 2009 to implement the Resolution with respect to newly trusteed assets, and provided additional temporary investment policy guidance and transition guidance in October 2009.

- The October 2009 temporary investment policy guidance directed PBGC to provide a monthly report on the transition to the target allocation. These reports and frequent communications with PBGC management provided information for the Board to oversee the implementation of the Resolution and subsequent guidance.

We are pleased that your latest report acknowledges that this Board and its representatives are meeting more frequently than past Boards, although we believe that the report overlooks much of the extensive oversight activity undertaken both by the Board directly and by our Board Representatives and their staffs. In addition to Board and Board Representative meetings with the PBGC Director, staff, and Advisory Committee members, the Board exercises its oversight responsibilities by providing policy direction through written resolution and through our Board Representatives. Other formal oversight mechanisms in place include required monthly transition and investment reports and written documentation of policy guidance. The Board believes these oversight mechanisms and informal guidance and communications are appropriate oversight.

The Board is dedicated to overseeing the management of PBGC's investment program and to protecting the pension benefits of the 44 million Americans covered by the PBGC's insurance program.

We appreciate the opportunity to review and comment on the draft report.

Sincerely,

Hilda L. Solis

HILDA L. SOLIS
Chair of the Board
Pension Benefit Guaranty Corporation

Appendix V: Comments from the Pension Benefit Guaranty Corporation

Pension Benefit Guaranty Corporation
1200 K Street, N.W., Washington, D.C. 20005-4026

Office of the Director

June 15, 2011

Barbara D. Bovbjerg, Managing Director
Education, Workforce, and Income Security Issues
United States Government Accountability Office
Washington, DC 20548

Dear Ms. Bovbjerg: Barbara

This is in response to your request for comments on the GAO's draft report on PBGC's investment policy and practices (GAO-11-271).

As you know from our many conversations on these subjects, PBGC and its Board take our responsibilities as stewards of a substantial investment portfolio very seriously.

In developing both PBGC's investment policy and its investment practices, we have consulted widely, reviewed the practices in other institutions, both public and private, and developed a policy and procedures that we believe are consistent with the high standards that you have recommended for PBGC.

We agree with both of your recommendations and are implementing them. As you know, regarding your first recommendation, PBGC's Board recently approved a comprehensive investment policy statement following a thorough review of policy options and extensive consultation and analysis. The Board is responding separately on that issue. Management will implement the policy under continued Board supervision.

We agree with your second recommendation -- to develop clear investment operating procedures and guidelines -- and are doing so. After reviewing the practices of other institutions, PBGC's Corporate Investment Department has developed and is implementing new procedures and guidelines. These cover such areas as transition management, cash management, investment procedures, special situations, and manager due diligence. Working with our General Counsel, we also developed a set of ethical guidelines specifically tailored to our corporate investment activities.

We also reviewed GAO's analysis of PBGC's investment performance. Given the complexity and technical nature of the analytics used in your review, we are sharing our technical comments under separate cover. PBGC appreciates GAO's acknowledgement that, "on an asset-only basis, PBGC's portfolio achieved better risk-adjusted performance on its investments than that achieved by six of the seven benchmark portfolios."

As you know, investment industry practices are evolving continually. We are continuing to review both our practices and those of others. We look forward to your comments on the procedures we've implemented, and view our discussions as part of a continuous improvement process.

As always, we appreciate the opportunity to review and comment on the draft report. It is a pleasure to respond, and we are glad to have worked with you on this. We recognize and appreciate GAO's role as an informed watchdog of the public interest, and look forward to working with you to advance the goals of accountability and retirement security that we share.

Sincerely,

Josh Gotbaum

cc: PBGC Board of Directors

Appendix VI: GAO Contact and Staff Acknowledgments

Contact

Barbara Bovbjerg, (202) 512-7215 or bovbjergb@gao.gov

Staff Acknowledgments

In addition to the above, Orice Williams-Brown, Charles A. Jeszeck, Thomas McCool, Frank Todisco, Serena Agoro- Menyang, James Bennett, Susan Bernstein, Lawrance Evans Jr., Charles Ford, Kimberley M. Granger-Heath, Michael Hoffman, Gene Kuehneman, Sheila McCoy, Michael Morris, Christopher Ross, Margie Shields, and Craig Winslow made important contributions to this report.

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