Rehabilitating the Role of Active Management for Pension Funds

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Abstract

Pension fund returns can be decomposed into different sources, including market movements, asset allocation policy, and active portfolio management. We use a unique database covering the asset allocations of US defined-benefit pension funds for the period 1990-2008, and we test the role of each factor in explaining their returns. Our results shed new light on pension funds' sources of performance. While the previous literature emphasized that policy allocation accounts for the bulk of returns, leaving little room for active management, we show that taking explicit account of market movement can change the results significantly. Although active management plays a minor role in global asset allocation, its role is predominant in explaining returns to individual asset classes, whether traditional or alternative. This paper rehabilitates the contribution of active management as a source of performance for pension funds, at least at the asset class level.

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1. Introduction

An important issue for pension funds is to understand where their performance come from. Is it from strategic asset allocation (the choice of the benchmark or "policy" of the fund) or from active management (active bets around that benchmark)?

Many studies have emphasized the importance of asset allocation policy versus active portfolio management. The pioneering work of Brinson, Hood, Beebower (1986) (BHB) followed by many others (Brinson et al.,1991; Ibbotson and Kaplan, 2000 ; Vardharaj and Fabozzi, 2007) has shown that policy returns account for more than 90% of the return of most mutual and pension funds. But these studies did not take into account that a substantial portion of both the fund's return and the policy return is driven simply by market movements. For that reason, the close correlation between the two returns may be misleading and could simply signal that market returns are driving both. As Xiong et al. (2010) have shown, the portfolio's total return (net of all expenses and fees) can be decomposed into 3 components: (1) the market return, (2) the asset allocation policy returns in excess of the market, and (3) the return from active portfolio management (market timing, security selection, and fees). This recent work has shed a totally different light on previous analyses. Xiong et al. (2010) show that, on their sample of U.S. mutual funds, most of the fund's returns (around 80%) are explained by market movements. Asset allocation policy and active asset management account for approximately the same weight in the global return (after stripping out market movements).

While the principle of performance attribution is easy to understand, implementing it is less simple. What should the market portfolio be? In theory, it is the alternative portfolio that "would be held by an investor who is devoid of investment judgment" (Hensel et al., 1991). Following Xiong et al. (2010), we define it as the equally weighted return for all the funds in our universe.

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Xiong et al. (2010) examined a database of U.S. mutual funds. As far as we know, no studies have so far addressed a similar issue for pension funds, taking market movements into account. We use a unique database covering the asset allocations of U.S. defined-benefit pension funds for the period 1990-2008, provided by CEM Benchmarking Inc.,[1] to address a similar question. Xiong et al. (2010) studied only equity and balanced funds. As we have the detailed decomposition of the funds' returns among different asset classes (equities, bonds, cash, real estate, hedge funds, private equity, tactical asset allocation), we can refine the analysis for pension funds.

Our results shed new light on pension funds' sources of performances. While the previous literature (Brinson et al., 1991; Ibbotson and Kaplan, 2000) emphasized that policy allocation accounts for the bulk of funds' performance, leaving little room for active management, we show that taking explicit account of market movements can change the results significantly. Although active management plays a minor role in global asset allocation, its role is much greater in explaining returns to individual asset classes, whether traditional (equities, fixed income, and cash) or alternative (real assets, private equity, hedge funds, and tactical asset allocation). Active management accounts for a substantial portion of performance, much more so than policy allocation. This result is in line with Xiong et al. (2010), who studied a similar question for mutual funds, but differs significantly from the previous literature on pension funds. The reasons for this difference are twofold: first, the previous work did not consider the contribution of market movements to funds' returns and, as the recent work by Xiong et al. (2010) shows, this tends to change the picture significantly. Second the research did not look at the detailed level of individual asset classes'

[1] It would have been particularly valuable to expand the dataset until 2010 during the subprime crisis period, but CEM Benchmarking was unfortunately unable to provide the most recent dataset on pension funds' allocations.

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performances, where the opportunities offered by active management can be quite different. Our novel database allows us to remedy that shortcoming.

Our paper is organized as follows: Section 2 presents data and descriptive statistics. Section 3 sets out our methodology. Section 4 assesses the determinants of US defined-benefit pension funds' return. Section 5 concludes.

2. Data and summary statistics

2.1. Data

Our dataset comes from CEM Benchmarking Inc.,[2] a Toronto-based firm providing a range of performance benchmarking services to leading pension funds in Europe, North America, and the Pacific Rim. The data consist of the yearly asset allocations, total returns, and policy returns of a panel of 143 U.S. defined-benefit (DB) pension funds from 1990 to 2008. The information relates to: (1) assets under management (millions of dollars) by asset class, nature of management (active/passive)[3] and delegation (external/internal);[4] (2) actual[5] asset allocation and actual returns by asset class and by nature of delegation; (3) policy[6] asset allocation and policy returns by asset class; and (4) management costs/fees by asset class. Additional useful information includes the type of ownership (public/private).

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[2] The CEM Benchmarking database was used for the first time by French (2008), who compares the fees, expenses, and trading costs paid by institutional investors to invest in the U.S. stock market with an estimate of what would be paid if everyone invested passively. It was subsequently used by Bauer et al. (2010), who document the performance and costs of the domestic equity investments of a large sample of U.S. pension funds in comparison with mutual funds.

[3] Passive management refers to indexed management.

[4] External management refers to delegated management to a third party (an asset manager or hedge fund).

[5] Actual asset allocation refers to the realized asset allocation of the pension fund.

[6] Policy asset allocation refers to strategic or target asset allocation defined by the pension fund, which can differ from the actual allocation for different reasons: cost of implementation, tactical bets added by the fund, etc.

According to the OECD (2011), U.S. pension funds' assets under management accounted for $8.22 trillion in 2008 and DB pension funds for around one half. The CEM Benchmarking database covers a big proportion of U.S. DB pension funds, with $2.35 trillion under management in 2008. Given the scarcity of standardized pension fund data, this database is particularly representative of the U.S. pension fund universe. Moreover, CEM Benchmarking data partially resolve problems of self-reporting bias because they are anonymous (Bauer et al., 2010). Consequently, funds have less incentive not to report in years when they perform badly. This is an advantage because a lack of comprehensive information about returns and costs severely hinders the study of pension fund performance.

On average, the database accounts for 143 pension funds. The number ranges between 51 (in 1990) and 215 (in 2007), with assets under management ranging from $336.5 billion to $2,748.6 billion (respectively in 1990 and 2007). Figure A.1 in the appendix A shows the changes in assets under management covered by the CEM Benchmarking database throughout the sample period. AUM tended to increase steadily, except during the dot.com crisis (2001) and the subprime crisis (2008), which naturally led to a sharp decrease as a result of market movements.

2.2. Summary statistics

Table 1 below displays the average (over all pension funds) policy allocation and actual portfolio allocation over 1990-2008, by asset class[7] reported in the CEM Benchmarking database.

[Insert Table 1 here.]

[7] According to CEM Benchmarking, derivative positions are usually included in the exposures to asset classes. For example, currency hedging may be included in the asset classes if the hedging is done at that level. Swaps that change the economic exposure for strategic reasons are included in the asset class.

The differences between policy weights and actual weights are very small. Equities are the main asset class, accounting for around 58% of the portfolio, followed by fixed income assets, which represent around 31%. The remainder of the portfolio is allocated to alternative classes, mainly real assets (around 4%) and private equity (around 3%). The allocation to hedge funds represents around 1%, and the tactical allocation (TAA) less than 1%. On average, the actual weights allocated to alternatives (around 8%) are slightly smaller than the strategic weights (10%). Cash accounts for just 1% or so of the asset allocation.

Figures A.2 and A.3 in the appendix A display the changes in the actual and policy asset allocations of pension funds over 1990-2008. The actual weight of stocks increased slightly (from 54% to 61%) between 1990 and 2000 and then decreased to 54% until 2008. The fixed income weight remained fairly stable over the sample period, whereas the weight dedicated to cash decreased continually from 2.4% to 0.6%. The allocation to real assets decreased from 5.5% in 1990 (the onset of the real estate crisis) to 4.8% in 2001 (the dot.com crisis) and subsequently increased to 7.8%. The allocation to alternatives increased over the study period for hedge funds and private equity (respectively from 0.6% to 2.9%; and from 2.7 % to 4.6 %), but the TAA decreased (from 2.3% to 0.6%). The trends in policy asset allocation exhibit similar patterns. As expected, the actual weights show more volatility than the policy weights (which define the strategic allocation) and tend to track market movements more closely. This is particularly true for the equity weights, which fell sharply during the dot.com and subprime crises. In times of turbulence, pension funds' asset allocation to stocks tends to decrease, not just because market capitalization decreases but also because pension funds tend to reallocate the stock portion of their portfolio to fixed income during these flights to quality, (OECD, 2010), and *vice versa* when crisis is over.[8]

Actual yearly returns are given for each fund's global asset allocation and for each asset class invested (sub-divided into geographical zones for equities and geographical zones and asset categories for fixed income).[9] By contrast, policy returns are given for each individual asset class only. The global asset allocation policy return of fund i at time t is thus calculated as the proportion of fund i invested in asset class n declared at time t (end of year) multiplied by the return of asset class n between time t and $t+1$, also provided in the database. This corresponds to the returns of fund i's strategic asset allocation.

Table 2 reports the average annualized actual returns (net of fees) and policy returns of U.S. DB pension funds over the period 1990-2008. The most attractive returns are obtained by private equity (12.0% and 13.0% for the actual and policy returns respectively) and to a lesser extent by equities (9.4% for actual, 9.6% for policy) and TAA (9% and 9.2%). Hedge funds and cash earned the lowest returns over the period: 1.7% actual returns and 3.8% policy returns for the first, 4.6% actual and 4.1% policy for the second. Even taking fees into account, actual returns are not always smaller than policy returns; in fact, they are slightly higher for the global asset allocation (8.7% vs 8.6%), and for fixed income (7.4% vs 7.2%) and cash (4.6% vs 4.1%). The differences between actual and policy returns tend to be small for traditional asset classes (less than 0.5%), but can be substantial for alternative assets (2.1%

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[8] This behavior contrasts with the Dutch pension funds which, tended to be contrarian in times of turbulence, especially during the stock market crash of 2002-2003 (De Haan and Kakes, 2011).

[9] The referenced categories for equities are the following: U.S., Canada, EAFE (developed markets outside U.S. and Canada), Global, Emerging, ACWI (All countries ex U.S.), Others. For fixed income: U.S., Canada, EAFE, Global, Emerging, Inflation Indexed, High Yield, Mortgages, Long Bonds, Others.

for hedge funds for example). For alternatives as a whole, pension funds' actual allocations earn smaller returns on average than policy allocations.

[Insert Table 2 here.]

Figures A.4 in the appendix A report changes in average actual returns and the dispersion of actual returns across all pension funds[10] over the study period. Figures A.5 display the same information for policy allocation. As expected, the cross-section volatility of actual returns is higher than that of policy returns. Moreover, the dispersion of alternative asset classes returns among funds is higher than the dispersion of traditional asset classes. Intuitively this is consistent with more pronounced active management in alternative assets, an observation confirmed by our results in section 3. Dispersion is also volatile over time and generally higher in crisis years, when the differences between "winners" and "losers" become more apparent.

3. Methodology

The total return of each fund can be decomposed into 3 components: (1) the market return, (2) the return from the asset allocation policy (its deviation from the market), and (3) the return from active portfolio management, depending on the pension funds' ability to tactically overweight or underweight asset classes, sectors, or securities relative to the policy.

$$R_{it} = M_t + (P_{it} - M_t) + (R_{it} - P_{it}) \qquad (1)$$

with R_{it} fund i's total return at date t, M_t the market's total return (average return over all funds) at date t, and P_{it} the total policy return of fund i at date t.

[10] The cross-sectional fund dispersion at time t is defined as the standard deviation of cross-sectional fund returns at time t.

Defining the market return is tricky. Following Xiong et al. (2010), we define it as the average return of all the funds (equally weighted) in our sample. This definition is not without bias, as this portfolio not only follows market movements but may also reflect a judgment shared by a majority of pension funds (for example, to overweight a specific asset class based on a positive opinion among all investors on its outperformance).

Note that alternative definitions have been used for the market portfolio. One way to define it could be to consider market capitalization weighted average returns of selected indices reflecting total market movement for each period.[11] This solution presents practical difficulties in our case as our database does not provide precise enough information on which benchmark indices to use (hedged or not against currency risk for example). As robustness check, we have also tested this market definition for global asset allocation, equities and bonds asset allocations.

Moreover, any measure of DB pension fund performance should be judged against its liability structure, which is a crucial benchmark for asset management. A complete ALM approach is unfortunately not feasible as we do not have the precise structure of each fund's liabilities. In the case of pension funds, long-term liabilities are usually indexed on inflation, an approximation would be to consider a portfolio of U.S. inflation-linked bonds. This is beyond the scope of our paper. We limit our analysis to the asset side of pension funds' balance sheets.

Our methodology follows Brinson et al. (1986) but with a significant difference. We measure the impact of the pension funds' policy decision as the difference from a market return, whereas Brinson et al. (1986) don't, implicitly supposing a zero return for the market. This reduces the explanatory power of the policy decision as a source of return volatility, compared to the results of Brinson et al. (1986). The difference of course depends of the market

[11] Hensel et al. (1991) consider the minimum risk portfolio.

portfolio considered. It is small when the market portfolio is made of low volatility assets such as Treasury Bonds, it is much larger when it is made of equities, or when it is the average asset allocation of pension funds in our database.

To measure the contribution of each of the 3 sources of performance in the total variance of the funds, Xiong et al. (2010) ran 3 separate regressions of the fund's return on each of the components and a constant: R_{it} vs M_t, R_{it} vs ($P_{it} - M_t$) and R_{it} vs ($R_{it} - P_{it}$), and then computed the R-square of each regression. We call β_M, β_P and β_S the coefficients of each univariate regression. R_{it} can be decomposed in the following way:

$$R_{it} = \alpha + \beta_M M_t + \beta_P (P_{it} - M_t) + \beta_S (R_{it} - P_{it}) + \varepsilon_{it} \qquad (2)$$

with ε_{it} a residual term defined by differentiating R_{it} from the 3 components.

Taking the covariance from both sides of equation (2) and dividing by the variance of R_{it}, it follows that:

$$R_{iM}^2 + R_{iP}^2 + R_{iS}^2 + R_{i\varepsilon}^2 = 1 \qquad (3)$$

where R_{iM}^2, R_{iP}^2 and R_{iS}^2 are the R-square of univariate regressions and $R_{i\varepsilon}^2$ is a balancing item proportional to the covariance between ε_{it} and R_{it}.

Running the 3 univariate regressions allows us to measure R_{iM}^2, R_{iP}^2 and R_{iS}^2, i.e. the percentage of the variance of the total return of each fund explained by the market return, the policy return and active management. $R_{i\varepsilon}^2$ is a residual effect, called the "interaction effect", estimated by taking the difference between 1 and the sum of the 3 R-square values. It measures the percentage of the variance of the fund's return explained by the interaction between the market returns, policy returns and active returns.

Lacking a sufficiently long time series (annual data over the period 1990-2008), we used a methodology that was slightly different but based on exactly the same principle. Instead of running univariate regressions on each fund, then averaging the calculated R-square values across funds, we ran 3 unbalanced pooled regression models, regressing the vector of the funds' returns, R_t, on the 3 vectors of the return components, M_t, $(P_t - M_t)$ and $(R_t - P_t)$.[12] The choice of a random coefficient model (not taking into account fixed effects) relies on the fact that all the pension funds in the database belong to a peer group and no information is provided to distinguish between their characteristics. It is also confirmed by diagnostic tests (see Hausman test results in Table B.1 in Appendix B).

Regressions have been conducted on the global asset allocation performance, but the originality of our database also allows us to perform them on each specific asset class. We can measure if the allocation choice inside each asset class (e.g. inside the fixed income universe, the choice between government, corporate, and emerging market bonds) accounts for a significant part of the performance or if most of the returns come from active management (sector, style allocation, security selection).

4. Results

We analyze the contribution of each of the three sources of performance (market movements, policy allocation and active management) in the total variance of the funds. Table 3 presents the results of panel regressions on the funds' total returns. It shows the average contribution of each of the three components, in terms of R-square. Panel A presents our main results, where market returns are the average return of all funds (equally weighted). Panel B presents robustness checks with an alternative market returns measures made of broad indices

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[12] As stressed by Xiong et al. (2010), one difficulty with this analysis is that the results are dominated by overall market movements. To confirm our results, we run a second type of regressions, this time analysing the funds returns in excess of the market and decomposing them into 2 components: the policy excess market return and the active return component and regressing $(R_{it} - M_t)$ vs $(P_{it} - M_t)$ and $(R_{it} - M_t)$ vs $(R_{it} - P_{it})$. The results are very close. For clarity of presentation, the next section provides the results of the first decomposition only.

of stocks (MSCI All Country World Index)[13] and fixed income (JP Morgan Global Aggregate Bond Index US)[14] and a diversified portfolio made of 65% stocks and 35% fixed income for global asset allocation, corresponding to the average asset allocation of all pension funds over the period. Benchmark indices have been chosen as the most representative of investment universe of pension funds.[15] Detailed regression results are available in Table B.1 in Appendix B.

[Insert Table 3 here.]

The volatility of global asset allocation returns is mainly explained by overall market movements (90% of the performance comes from the market in Panel A). Policy allocation and active management account for only a small part of the return volatility (respectively 4% and 2%). This result is consistent with Ibbotson and Kaplan (2000), Xiong et al. (2010), who find similar results on mutual funds' asset allocations. As we have defined market return as the average policy return of all the pension funds in our database, this first result reveals that U.S. DB funds differed only slightly in their global asset allocation.

The refined regressions on the funds' returns by asset class reveal different results depending on the class. Market movements are predominant for the main traditional assets

[13] The MSCI AC World Index (in USD) is a market capitalization weighted index designed to measure the equity market performance of developed and emerging markets. It consists of 45 country indices comprising 24 developed and 21 emerging market country indices.

[14] The JP Morgan Global Aggregate Bond Index US represents six distinct asset classes: US Treasuries, Emerging Markets External Debt, US Credit, Emerging Markets Credit, US MBS, and US Agencies in USD. It is constructed from over 3,200 instruments issued from over 50 countries, and collectively represents US$8.6 trillion in market value. It provides a reliable and fair benchmark for an investment-grade portfolio manager.

[15] As such indices do not exist for each asset class we limited our analysis to stocks and bonds, representing the most substantial part of the pension funds' portfolio.

(stocks, fixed income) compared with cash and alternative assets. For equities, 96% of the return volatility is explained by market movements, 0% by active management and 2% by policy allocation. The very high percentage of variance explained by market movements is linked to strong homogeneity in the equities sub-asset classes. The correlation between developed stock markets (U.S., Canadian, EAFE, Global), which represent on average 94% of pension funds' asset allocation, is above 80% (Hyde et al., 2007).

For fixed income, 70% of the volatility is explained by overall market movements, 20% by active management and only 3% by the policy allocation. Compared with equities, the fixed income sub-asset classes exhibits much greater heterogeneity. Government bonds (both nominal and inflation-linked), corporate investment grade, high yield, emerging, mortgages, etc. show significant diversification potential (Brière and Szafarz, 2008; Brière and Signori, 2009). Pension funds can also exploit time variation in the bond risk premia (Koijen et al., 2010).[16] Consequently, market movements explain a much smaller share of a fund's volatility than do the equity asset class. Active management is an important determinant of performance, explaining 20% of the return volatility.

Taking alternative measures of market returns (Panel B) confirm previous results. Market movements still explain the most substantial part of the volatility of global allocation (84%). Asset allocation and active management account for a negligible part (2% and 1% respectively). For stocks and bonds, market movements still explain the bulk of the variance of returns, but a somewhat slightly lower share (88% in Panel B vs 96% in Panel A for stocks, 56% vs 70% for bonds). For fixed income, asset allocation has a stronger importance (21% in Panel B vs 3% in Panel A). These results are due to the fact that this alternative definition of

[16] There is strong empirical evidence supporting bond return predictability (Dai and Singleton, 2002; Cochrane and Piazzesi, 2005), whereas equity return predictability is still debated (Ang and Bekaert, 2006).

our market indices (especially for fixed income) does not exactly match the funds' universe of investment.

Concerning cash investment, only 26% of return volatility can be explained by market movements. Cash volatility is very small and usually close to zero. Half of the residual performance comes from the policy asset allocation, the other half from active management.[17] This is hardly surprising because the cash asset class is comprised of quite different investments, ranging from money market interest rates to short-term bonds (govies and corporates). As a result, funds' performances during the study period are relatively uneven (Figure A.4 in the appendix A). Each pension fund's choice of investment vehicles can therefore significantly alter the performance of the target allocation.

While the performance of traditional asset classes is driven mainly by market movements, we observe a radically different picture for alternative assets. Market movements account for a smaller proportion for real assets, hedge funds, private equity, and TAA (respectively 47%, 54%, 26% and 75%). Active management plays a significant and comparable role (accounting respectively for 40% of the performance for real assets and hedge funds, 54% for private equity and 16% for TAA). This is much greater that the policy allocation, which makes the smallest contribution to performance (less than 5% for all alternative asset classes). These results are consistent with the fact that these asset classes show much greater heterogeneity in their performances and offer possibilities for tactical bets (Swensen, 2000; Agarwal and Naik, 2000).[18]

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[17] Note that for the cash asset class, active management may be due to pension funds' use of cash to hedge outflows related to payment of retirement benefits.

[18] For instance, private equity funds are specialized in funding innovation via corporate creation (venture capital), growth of small and midsized corporates and the purchase of diverse corporates (leveraged buyouts). Hedge funds use a wide range of financial strategies, from conventional global macro arbitrage funds to event driven strategies.

One surprisingly consistent result over all individual asset classes is that active management is a much greater source of performance than asset allocation policy. The reverse is true for global asset allocation, where the allocation policy provides a slightly higher source of performance than does active management for the funds, though both sources are very close. These results confirm the importance of active management as a source of performance within each asset class.

5. Conclusion

This paper attempts to explain the performance of pension funds via an original database of U.S. DB pension funds. We perform panel regressions to test the role played by asset allocation, active management and market movement in the volatility of returns for an overall asset allocation and for each asset class.

Global asset allocation is mainly explained by overall market movements. Policy allocation and active management account for a very small part (less than 4%) of return volatility. This is consistent with Ibbotson and Kaplan (2000), Xiong et al. (2010), who find similar results on mutual funds' asset allocations. It also reveals that most U.S. DB pension funds differed only slightly in their global asset allocation. But a refined analysis by asset class reveals a different picture. (Unlike previous authors, hampered by data availability issues, we were able to make a fine-grained analysis thanks to our highly detailed database.) While the previous literature has emphasized that policy allocation accounts for the bulk of pension funds' performance, leaving little room for active management, we show that if market movements are taken explicitly into account, the results can change significantly at the individual asset class level. Only for global asset allocation does the allocation policy provide a slightly higher performance than active management (4% vs 2%). For all individual asset classes except equities, active management is the greatest source of performance; it explains a much higher share of the funds' return volatility (26% in average) than do their strategic choices (4% in average on all asset classes). This new result confirms the importance of TAA as a source of performance for pension funds.

We unfortunately had to terminate our study at end-2008 due to availability problems with CEM Benchmarking data, the only source of detailed information on pension fund allocations by asset class. An interesting and natural extension of our work would be to examine whether the recent crisis has significantly altered our findings.

Appendix A

Fig. A.1
Average assets under management (US$ billion) of US DB pension funds, 1990-2008

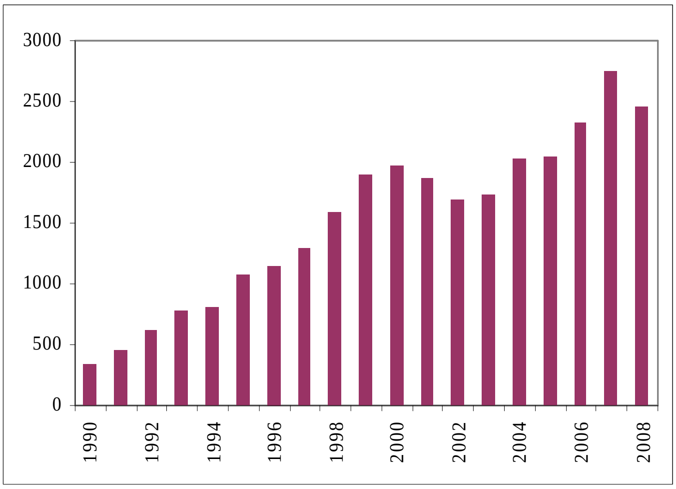


Fig. A.2
Average policy asset allocation of US DB pension funds, 1990-2008

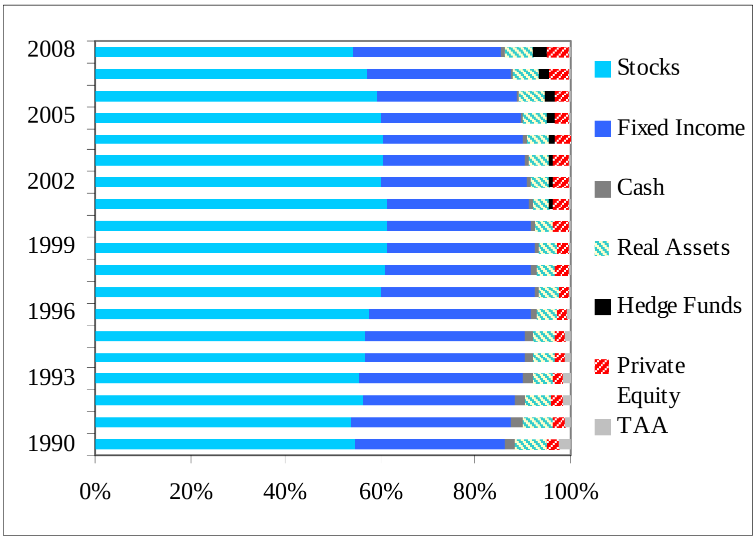


Fig. A.3
Average actual asset allocation of US DB pension funds, 1990-2008

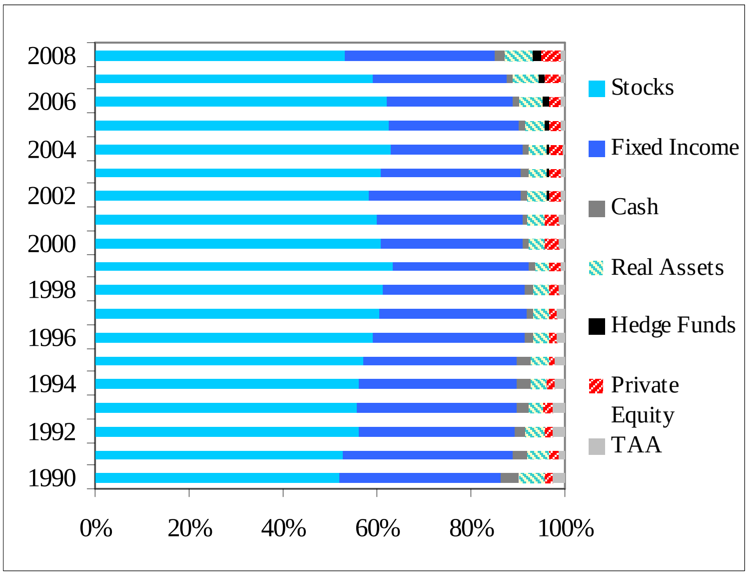


Fig. A.4

Average actual returns and dispersion of actual returns across funds of US DB pension funds, 1990-2008

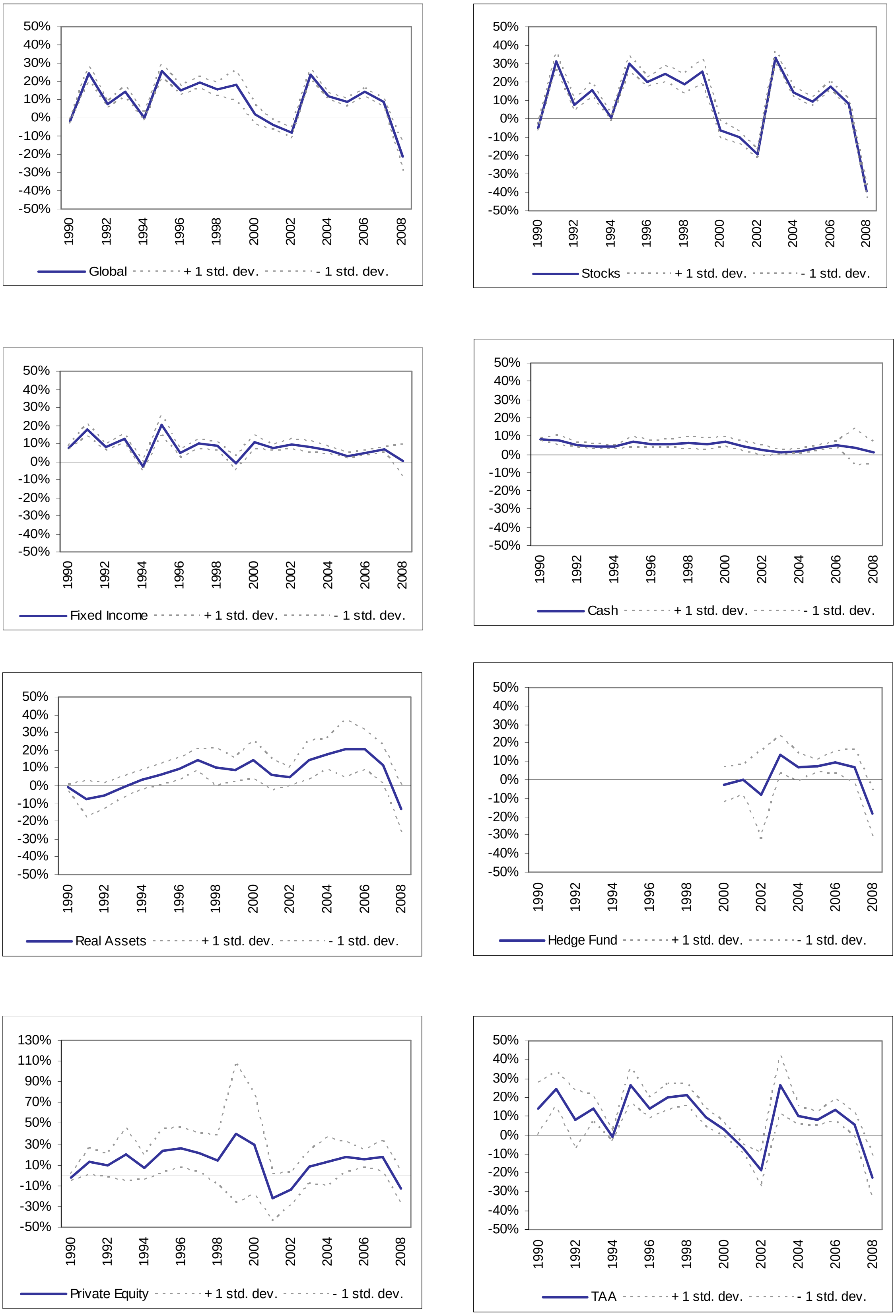
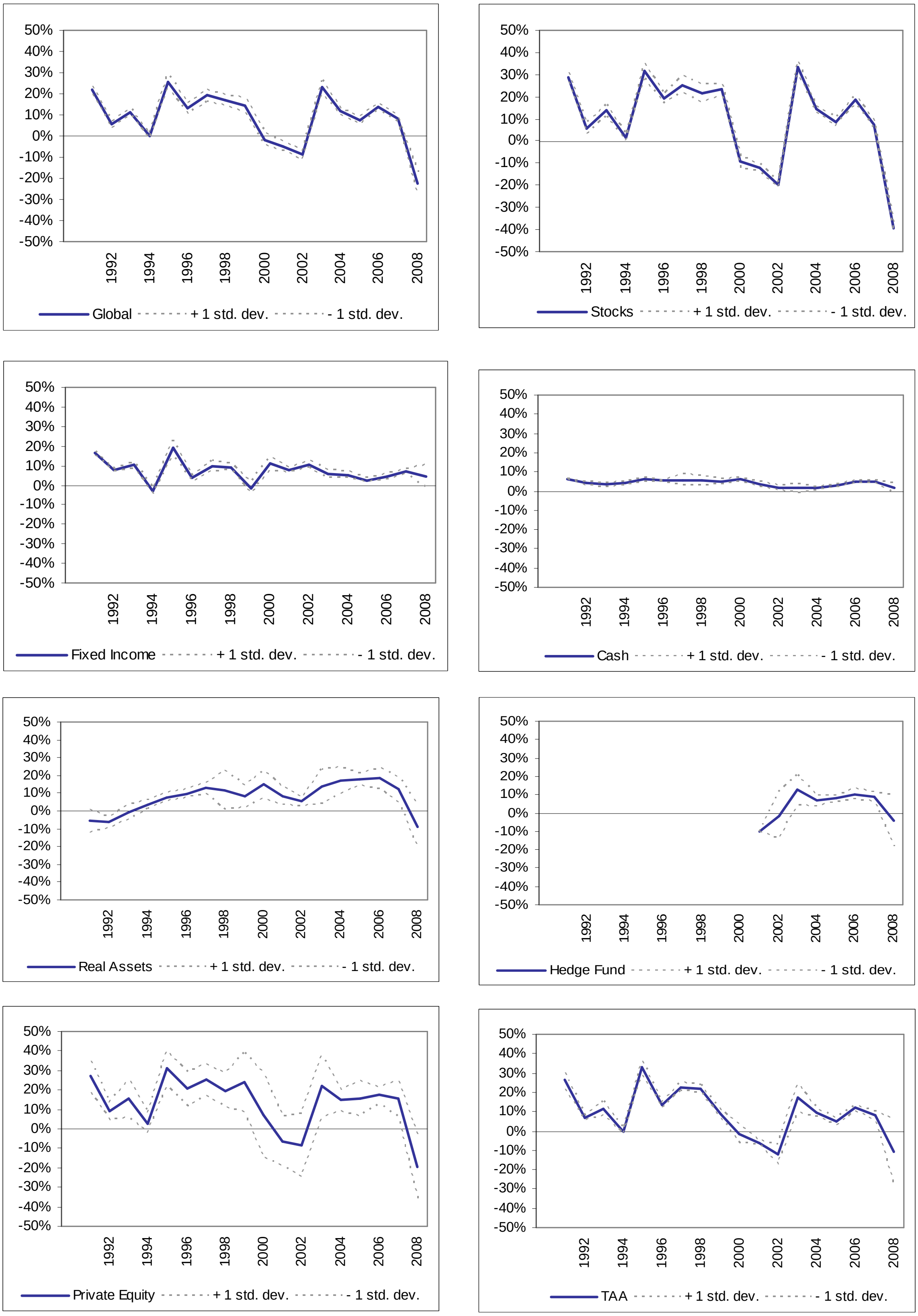


Fig.A.5
Average policy returns and dispersion of policy returns across funds of US DB pension funds, 1990-2008



Appendix B

Table B.1

Panel regression results of pension fund's returns on market, asset allocation policy and active management returns, 1990- 2008

	Global Allocation	Stocks	Fixed Income	Cash	Real Assets	Hedge Funds	Private Equity	TAA
Panel A: market returns defined as average returns of all pension funds								
Regression on Market Returns								
C (t-stat)	-0.02 (-0.17)	-0.08 (-0.82)	0.02 (0.13)	-0.15 (-0.51)	0.08 (-0.30)	-0.23 (-0.23)	-0.32 (-0.34)	-0.31 (-0.47)
beta (t-stat)	0.99*** (171.42)	0.99*** (258.29)	0.99*** (84.97)	0.99*** (22.73)	1.00*** (45.49)	0.97*** (16.34)	0.95*** (27.42)	1.01*** (35.54)
R2	90%	96%	70%	26%	47%	54%	26%	75%
SE	3.87	3.98	3.52	2.81	9.18	9.28	24.35	7.25
Durbin Watson	1.70	1.7	1.82	1.11	1.66	1.11	1.84	1.39
Hausman test	0.16	2.42	0.17	0.01	0.33	0.77	9.83	2.50
Regression on Asset Allocation Policy Returns								
C (t-stat)	8.43*** (26.66)	8.36*** (17.19)	6.72*** (49.65)	4.86*** (34.99)	8.49*** (19.91)	0.99 (0.52)	12.07*** (13.64)	8.62*** (5.17)
beta (t-stat)	0.80*** (9.06)	0.97*** (6.67)	0.38*** (8.51)	0.66*** (9.36)	0.28*** (5.83)	-0.22 (-1.56)	-0.24*** (-4.84)	-0.39** (-2.19)
R2	4%	2%	3%	13%	2%	2%	2%	5%
SE	12.78	19.88	6.27	2.46	12.58	13.84	25.97	14.58
Durbin Watson	1.41	1.38	2.29	1.23	1.08	1.29	1.65	1.52
Hausman test	4.51	2.67	1.72	9.72	2.42	0.58	26.67	0.24
Regression on Active Management Returns								
C (t-stat)	7.59*** (23.15)	7.88*** (16.27)	6.73*** (53.42)	4.23*** (40.03)	8.73*** (25.68)	2.41* (1.68)	10.24*** (14.11)	8.89*** (5.64)
beta (t-stat)	0.49*** (5.79)	0.32*** (2.92)	0.89*** (22.65)	0.92*** (17.71)	0.95*** (31.01)	0.82*** (8.30)	0.78*** (35.34)	0.71*** (4.60)
R2	2%	0%	20%	36%	40%	40%	54%	16%
SE	12.89	0.4%	5.70	2.19	9.92	10.92	17.48	13.55
Durbin Watson	1.38	1.34	2.64	0.91	1.11	1.53	1.37	1.54
Hausman test	0.29	1.47	3.81	0.05	0.65	0.42	4.62	2.09
Panel B: alternative measure of market returns (broad equity and bond indices)*								
Regression on Market Returns								
C (t-stat)	1.91*** (13.52)	2.21*** (13.86)	0.31** (2.05)					
beta (t-stat)	0.92*** (124.23)	0.91*** (146.12)	0.95*** (61.31)					
R2	84%	88%	56%					
SE	5.15	6.79	4.35					
Hausman test	1.25	5.93	8.61					
Regression on Asset Allocation Policy Returns								
C (t-stat)	7.62*** (25.39)	7.82*** (16.88)	6.76*** (54.21)					
beta (t-stat)	0.42*** (6.68)	0.23*** (3.19)	0.98*** (23.14)					
R2	2%	0.4%	21%					
SE	12.94	20.11	5.68					
Hausman test	27.63	19.71	2.69					
Regression on Active Management Returns								
C (t-stat)	7.59*** (23.15)	7.88*** (16.27)	6.73*** (53.42)					
beta (t-stat)	0.49*** (5.79)	0.32*** (2.92)	0.89*** (22.65)					
R2	1%	0.4%	20%					
SE	12.89	20.06	5.70					
Hausman test	0.29	1.47	3.81					

*** significant at 1%,; ** at 5%; * at 10%.

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Table 1

Average policy allocation and actual asset allocation (%) of US DB pension funds, 1990-2008

	Stocks	Fixed Income	Cash	Real Assets	Hedge Funds	Private Equity	TAA
Policy Allocation	58.29	31.44	1.19	4.71	1.51	2.91	0.82
Actual Allocation	58.63	31.21	1.95	4.07	0.79	2.41	1.40

Real assets include: (1) commodities: physical exposure, commodity funds or products investing in an index like the Goldman Sachs Commodities Index, (2) REITs, (3) real estate ex-REITs, (4) infrastructure, and (5) other investments such as oil & gas partnerships, timber, etc.
TAA stands for tactical asset allocation (fully funded long-only segregated asset pool dedicated to tactical asset allocation).

Table 2

Average annualized returns of U.S. DB pension funds, 1990-2008

	Global	Stocks	Fixed Income	Cash	Real Assets	Hedge Funds	Private Equity	TAA
Policy Return	8.6%	9.6%	7.2%	4.1%	7.8%	3.8%	13.0%	9.2%
Actual Return	8.7%	9.4%	7.4%	4.6%	7.1%	1.7%	12.0%	9.0%

Table 3

Decomposition of pension funds' actual net returns in terms of R-square, panel regressions, 1990- 2008

	Global Allocation	Stocks	Fixed Income	Cash	Real Assets	Hedge Funds	Private Equity	TAA
Panel A: market returns defined as average returns of all pension funds								
Market	90%	96%	70%	26%	47%	54%	26%	75%
Asset Allocation	4%	2%	3%	13%	2%	2%	2%	5%
Active Management	2%	0%	20%	36%	40%	40%	54%	16%
Interaction effect	4%	2%	7%	25%	11%	4%	18%	4%
Panel B: alternative measure of market returns (broad equity and bond indices)*								
Market	84%	88%	56%					
Asset Allocation	2%	1%	21%					
Active Management	1%	0%	20%					
Interaction effect	13%	11%	3%					

** MSCI World all country index for stocks, JP Morgan Global Aggregate Bond Index US for bonds and a diversified portfolio made of 65% stocks and 35% bonds for global asset allocation.*