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The Explanatory Power of Policy Asset Allocation

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Abstract

Data from 213 Japanese asset allocation mutual funds over a six-year period (2002-07) indicates that, on average, the explanatory power of policy asset allocation is about 90% in terms of time series variability of a fund's returns, about 70% in terms of variation of return among funds, about 95% in terms of variation of standard deviation among funds, about 106% in terms of return level, and about 95% in terms of standard deviation level.

The average asset allocation fund does not see value added above the policy asset allocation after investment management fees. Average performance before costs, however, almost equals policy return. This shows that half of asset allocation fund portfolio managers outperform the policy return before investment management fees.

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1. Introduction

Recently in Japan, total net assets of diversified investment products such as balanced funds, fund of funds (FoFs), SMAs (separately managed accounts), and fund wraps have been increasing rapidly. What influence does policy asset allocation have on the performance of such asset allocation funds? Moreover, have asset allocation funds generated positive active return relative to the policy asset allocation (hereinafter PAA)?

Based on the data of US domiciled pension funds and mutual funds, many researchers in the US have presented the results of empirical analysis regarding the importance of asset allocation and in so doing have occasioned various discussions and controversies. However, there has not yet been a report of this kind based on the data of Japanese domiciled mutual funds.

The purpose of this study is to estimate the explanatory power of PAA with respect to three types of asset allocation funds from five different aspects and to indicate the possibility of achieving continuously positive active returns by measuring the information ratio and the autocorrelation coefficient of active returns. To this end, this study selected 213 Japanese asset allocation mutual funds from among 1) FoFs, 2) active balanced funds, and 3) index balanced funds.

2. Review of Previous Studies and Purpose of This Study

Brinson, Hood and Beebower [1986] was the first work to academically indicate the importance of asset allocation policy through empirical analysis, and has often been quoted, including in textbooks, to prove the importance of asset allocation. Through this study, asset allocation came to be recognized as the most important decision in the investment process among institutional investors in Japan.

The Brinson et al. study [1986], pursued time-series regression where the quarterly total return of 91 large US pension funds was an explained variable, and quarterly total return on a custom benchmark (based on average asset class weight over time being the proxy for each pension fund's PAA) an explanatory variable. This time-series regression analysis showed that the average coefficient of determination, R^2, of the 91 pension funds was 93.6%. Based on this result, more than 90% of the variability of the average US pension fund's return over time could be explained by policy return, and hence the importance of PAA (in terms of time series of variability of return) evidenced. Five years later, Brinson, Singer and Beebower [1991] came out with an update concluding that "policy returns accounted for 91.5 percent of the variance of actual returns" and which also explained the importance of asset allocation.

On the other hand, Jahnke [1997] refuted the conclusions of Brinson et al., due to his different point of view on the effect of asset allocation. Ibbotson and Kaplan [2000] integrated both studies by pointing out that Brinson and his colleagues' report was misinterpreted, that Brinson et al. did not intend to show how important asset allocation is in explaining the variation of performance among funds. In the Ibbotson et al. study, policy return explains about 90% of the variability in returns of a typical fund over time, about 40% of the variation of returns among funds, and 100% of the level of returns, and this study gives an integrated answer to the various questions on the importance of asset allocation.

The Pension Fund Association [2001] recognized the importance of constructing and maintaining policy asset mix through similar analysis to Brinson and Ibbotson by using annual returns over a ten-year period (1990-99) for 1,249 Japanese pension funds. It found that policy return explains about 91% of the variability of a fund's returns over time, about 15% of the variation of returns among funds, and about 115% of the level of returns.

Based on these studies, most asset allocation funds and pension funds construct PAA and control active weights that are the difference between actual weights and policy weights. Because it is difficult for most pension funds and mutual funds to add value above those PAA through asset-class timing. And they should control the risk level of the entire portfolio from a practical standpoint.

Therefore, this study analyzes whether PAA explains the risk levels of funds in addition to the three return-related points indicated by Ibbotson and Kaplan [2000]. Also, since there are three types of asset allocation funds (traditional active balanced funds which invest in individual securities or own mother funds, index balanced funds which invest in index funds or index mother funds, and finally FoFs which invest in multiple mutual funds), it distinguishes them and analyzes not only an average asset allocation fund, but also each type of funds. As a result, this study, also focusing on PAA, provides a more detailed and specific conclusion.

3. Framework

Monthly total return for each individual fund that reinvested its dividends is used. Since each total return is calculated from net asset value per unit and dividends, fees on purchase (sales loads and consumption tax), fees and expenses on redemption (partial redemption charges, redemption fees, and consumption tax, and tax on profit), and tax on dividends have not been deducted from each fund's total return. However operating expenses in holding a fund (management fees, distribution fees, custodian fees, brokerage fees, and taxes) have been deducted from each fund's total return.

To measure coefficients of determination of policy return in a fund's total return, and active return and active risk relative to policy return, each fund's monthly total return (TR_i) is decomposed into two components: monthly policy return (PR_i) that comes from its PAA, and monthly active return (AR_i) which is the remaining excess return relative to its policy return as shown in equation (1).

$$1+TR_{i,t} = (1+PR_{i,t})(1+AR_{i,t}) \quad (1)$$

Where

TRi,t：monthly total return of fund i in period t

PRi,t：monthly policy return of fund i in period t

ARi,t：monthly active return of fund i in period t

The reason active return is not the arithmetic subtraction but the geometric subtraction is because geometric mean return (hereinafter GMR) of a fund's total return is decomposed into the GMR of its policy return and GMR of its active return as shown in equation (2).

$$1+GMR(TR_i) = (1+GMR(PR_i))(1+GMR(AR_i)) \quad (2)$$

This monthly total return is after deducting management fees as mentioned above. To obtain a pure investment result, monthly total return before deducting management fees (TRB_i) is calculated approximately from monthly total return after deducting management fees (TR_i), each fund's annual management fees (C_i), and consumption tax (5%) as shown in equation (3).

$$1+TRB_{i,t} = (1+TR_{i,t})/(1-1.05C_{i,t}/12) \quad (3)$$

Each fund's monthly policy return is calculated from the policy weights of each fund, and monthly total returns on asset class benchmarks as shown in equation (4).

$$PR_{i,t} = w1_i R1_t + w2_i R2_t + \cdots + wm_i Rm_t \quad \text{However,} \quad \sum_{k=1}^{m} wk_i = 1 \quad (4)$$

Where

wk_i：policy weights of fund i of asset class k

Rk_t：monthly total returns on the asset class k benchmark in period t

4. Data

This study used monthly total returns for six years for 213 Japanese asset allocation funds that had over six years performance record as of December 2007 and were classified by Ibbotson Associates Japan (hereinafter IAJ) as asset allocation funds among Japanese domiciled open-ended public investment trusts.

As for each fund's management fees, IAJ provided a database of mutual fund fees and expenses obtained from each fund's securities registration statement. Some 213 Japanese asset allocation funds were identified and which break down into: 1) 22 FoFs, 2) 151 active balanced funds, and 3) 40 index balanced funds, using IAJ category data to measure the performance of each type.

Policy returns were calculated from actual policy weights and monthly total returns of 24 asset class benchmarks that composed the policy weights of each fund. For the policy weights of each fund, this study used the asset class category database IAJ collected from annual securities reports, prospectuses, and investment reports.

Fig.1 shows asset classes, benchmarks, and number of funds that incorporated the asset class into its PAA, the average policy weight of each fund on each asset class, standard deviation, and percentile. The five asset classes, as represented by Japan Equity Large Cap Blend, World ex-Japan Equity (no currency hedged), Japan Bonds Long/Intermediate, World ex-Japan Bonds (no currency hedged), and Japan's money market, are all incorporated into the PAA of over 100 asset allocation funds. **Fig.1** shows that these are the main asset classes of the PAA for Japanese asset allocation funds. Since these main asset classes are incorporated differently among funds, we can imagine that there are lots of variations in PAA among the funds.

Fig.1 Cross-sectional Distribution of Policy Weight for Asset Allocation Funds

	Asset Class	Benchmark	Number of funds	Average weight (%)	Standard deviation(%)	Percentile 5%	25%	50%	75%
1	Japan Equity Large Cap Blend	TOPIX	200	31.9	16.1	0	20	30	45
2	Japan Equity Small Cap Blend	Russell/NOMURA Japan Small Cap	5	0.2	1.4	0	0	0	0
3	World Equity (no currency hedged, in JPY)	MSCI World (no currency hedged, in JPY)	4	1.0	7.2	0	0	0	0
4	World Equity (currency hedged, in JPY)	MSCI World (currency hedged, in JPY)	5	0.8	5.8	0	0	0	0
5	World ex-Japan Equity (no currency hedged, in JPY)	MSCI Kokusai (no currency hedged, in JPY)	134	10.4	10.2	0	0	10	20
6	World ex-Japan Equity (currency hedged, in JPY)	MSCI Kokusai (currency hedged, in JPY)	18	1.3	5.5	0	0	0	0
7	U.S. Equity (no currency hedged, in JPY)	S&P 500 (no currency hedged, in JPY)	11	0.6	2.6	0	0	0	0
8	Europe Equity (no currency hedged, in JPY)	MSCI Europe (no currency hedged, in JPY)	15	1.4	7.1	0	0	0	0
9	Asia/Pacific Equity (no currency hedged, in JPY)	MSCI AC Asia Pacific Net of Taxes (no currency hedged, in JPY)	5	0.1	0.6	0	0	0	0
10	Emerging Markets Equity - Diversified (no currency hedged, in JPY)	MSCI Emerging Mkts (no currency hedged, in JPY)	4	0.1	0.6	0	0	0	0
11	Japan Bonds Long/Intermediate	NOMURA-BPI	187	34.4	21.1	0	20	35	50
12	Japan Bonds Short-Term	NOMURA-BPI Short-Term	5	0.8	5.6	0	0	0	0
13	Japan Convertible Bonds	NIKKO-CBPI	1	0.2	3.0	0	0	0	0
14	World Bonds (no currency hedged, in JPY)	Citigroup WGBI (no currency hedged, in JPY)	2	0.5	4.8	0	0	0	0
15	World Bonds (currency hedged, in JPY)	Citigroup WGBI (currency hedged, in JPY)	12	2.8	12.6	0	0	0	0
16	World ex-Japan Bonds (no currency hedged, in JPY)	Citigroup WGBI (ex Japan, no currency hedged, in JPY)	145	8.1	7.5	0	0	10	10
17	World ex-Japan Bonds (currency hedged, in JPY)	Citigroup WGBI (ex Japan, currency hedged, in JPY)	17	0.9	3.8	0	0	0	0
18	Europe Bonds (no currency hedged, in JPY)	LB Euro-Aggregate Bond (no currency hedged, in JPY)	2	0.5	4.8	0	0	0	0
19	Europe Bonds (currency hedged, in JPY)	LB Euro-Aggregate Bond (currency hedged, in JPY)	2	0.5	4.8	0	0	0	0
20	World Short-Term Bonds/Money (no currency hedged, in JPY)	Citigroup WGBI 1-3Yr (no currency hedged, in JPY)	1	0.1	1.0	0	0	0	0
21	US Short-Term Bonds/Money (no currency hedged, in JPY)	US 30 Day Tbill (no currency hedged, in JPY)	1	0.0	0.7	0	0	0	0
22	Japan REIT	TOPIX REIT	1	0.0	0.1	0	0	0	0
23	World ex-Japan REIT (no currency hedged, in JPY)	S&P Citigroup World REIT (ex Japan, no currency hedged, in JPY)	1	0.1	1.2	0	0	0	0
24	Japan money market	Overnight call money rates (with collateral)	112	3.5	7.0	0	0	2	5

Fig.2 shows risk and return before and after management fees of the 213 asset allocation funds and risk and return of the policy benchmarks of each fund. The risk level and return level are both widely distributed—it is clear that asset allocation policy among each fund is very different.

Fig.2 Risk and Return of Asset Allocation Funds and Policy Benchmarks (2002-07)

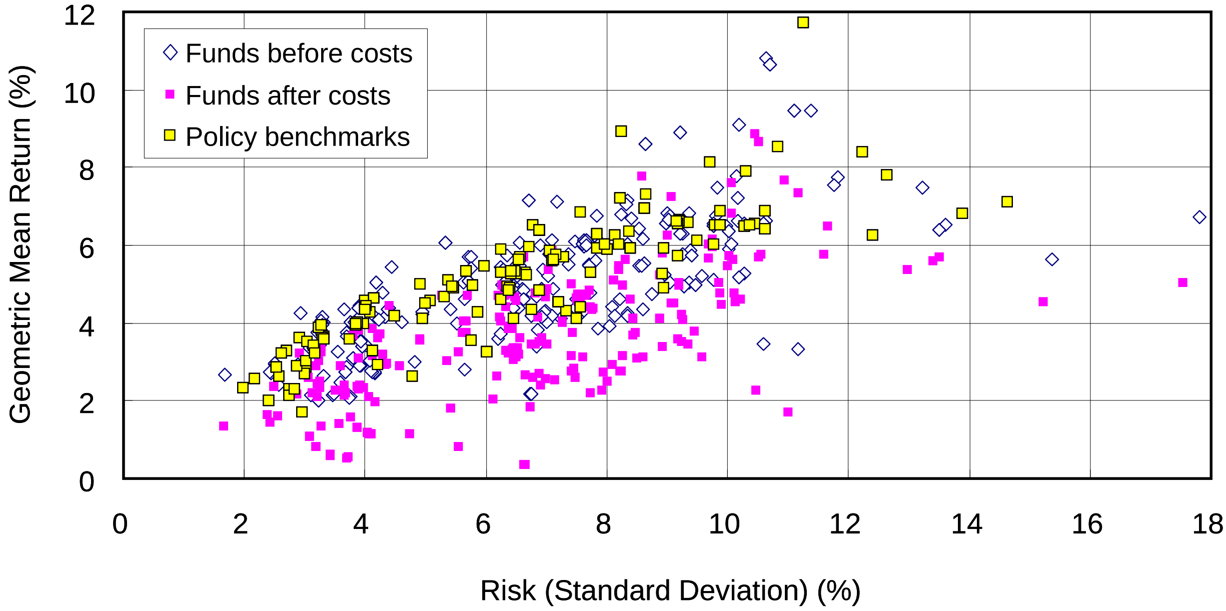
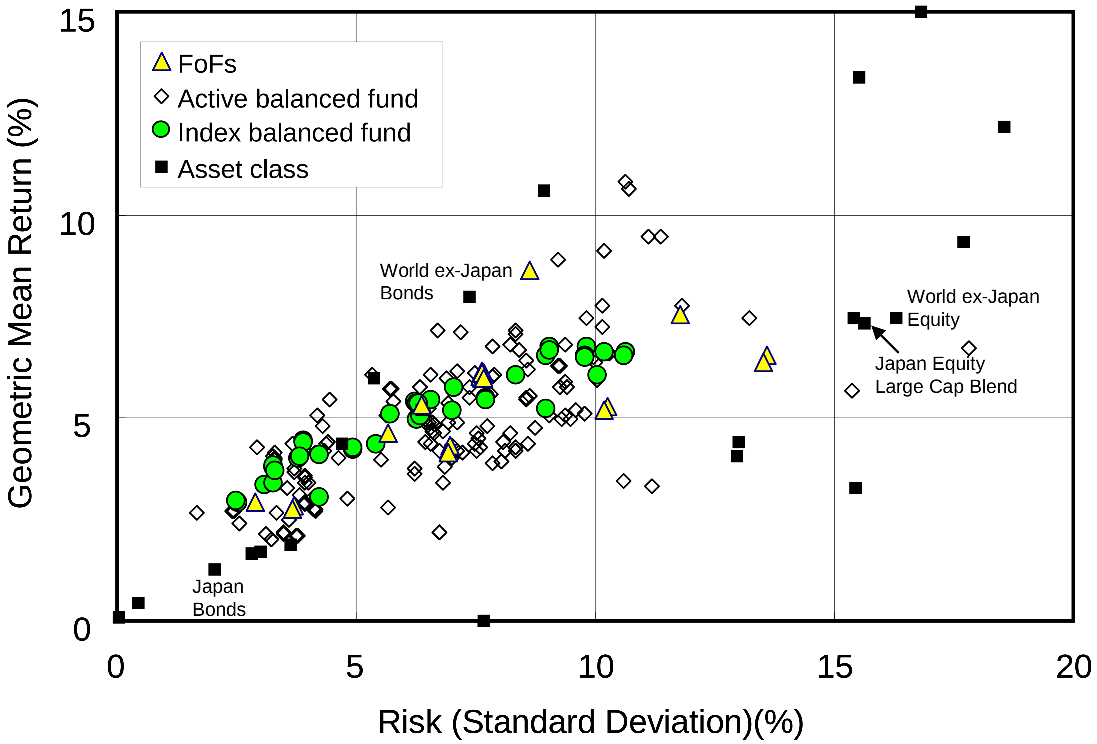


Fig.3 compares risk and return before the deduction of management fees on 1) FoFs, 2) active balanced funds, and 3) index balanced funds. Each is widely distributed, and we can see that the difference in risk and return is not caused by difference in type of funds.

Fig.3 Risk and Return of Asset Classes and Asset Allocation Funds (2002-07)



5. Explanatory Power of PAA

To investigate to what degree policy asset allocation (PAA) can account for the performance of Japanese domiciled asset allocation mutual funds, this study shows its explanatory power from five different aspects based on actual returns and policy returns.

(1) Time-Series Variability of a Fund's Returns Over Time

First, I discuss the explanatory power of PAA in terms of variability of return over time. This examination is similar to that of Brinson and Ibbotson and measures how much actual variability of return can be explained by the variability of policy return through time-series analysis by looking at the same fund. In other words, a fund's total return and its policy return would vary (up and down) every month; the analysis also shows to what extent a fund's return and its policy return are similar.

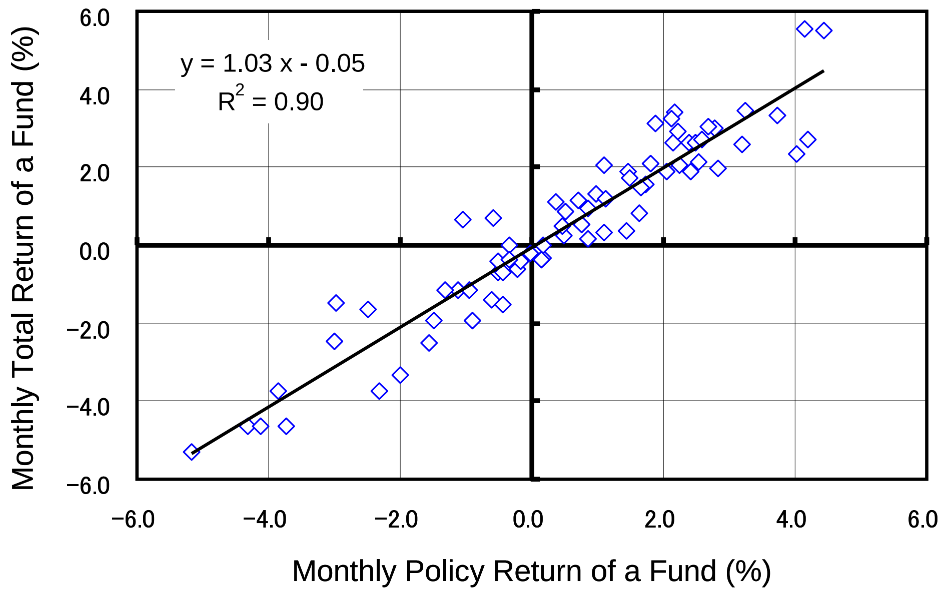
First, equation (5) measures 213 coefficients of determination (R^2) for each fund through 213 regression analyses from 2002 to 2007 by setting each fund's monthly total return before management fees (TRB_i) as an explained variable and the monthly policy return of each fund (PR_i) as an explanatory variable.

$$TRB_{i,t} = \alpha_i + \beta_i \cdot PR_{i,t} + \varepsilon_{i,t} \qquad (5)$$

Then, the average, median, and distribution of R^2 could be calculated for three types of funds.

To capture this time-series regression visually, **Fig.4** shows the scatter plots of a single fund's monthly total returns and its monthly policy returns, regression line, estimated regression equation, and coefficient of determination of a certain fund. Since most of the points cluster around the regression line, this shows that monthly performance is similar, and that fund return is mostly explained by policy return. In this case, R^2 is 90% throughout the analysis period. Therefore, 90% of the fund's return variability can be explained by the variability of the fund's policy return.

Fig.4 Monthly Total Return and Policy Return of an Asset Allocation Fund (2002-07)



Equation (6) derived from Equation (5) shows the relationship between the variance of monthly total return and the variance of monthly policy return, beta, and variance of active return.

$$\sigma_{TRB_i}{}^2 = \beta_i{}^2 \cdot \sigma_{PR_i}{}^2 + \sigma_{\varepsilon_i}{}^2 \quad (6)$$

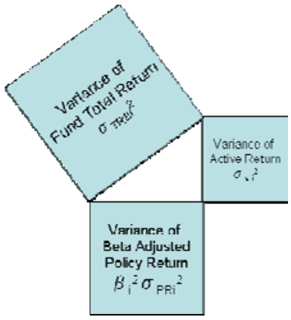
Therefore, equation (7) derived from equation (6) explains that the coefficient of determination on regression analysis (R^2) is the variance ratio of beta-adjusted policy return against the variance of the fund's total return. **Fig.5** shows that R^2 value is the ratio of the area of the square below against the area of the square upper left.

$$R_i{}^2 = 1 - \frac{\sigma_{\varepsilon_i}{}^2}{\sigma_{TRB_i}{}^2} = \frac{\beta_i{}^2 \cdot \sigma_{PR_i}{}^2}{\sigma_{TRB_i}{}^2} \quad (7)$$

This is why it is said that the Brinson study explained the variance of total return of a fund by the variance of policy return.

Equation (7) shows that the bigger the active risk, the lower R^2, and vice versa.

Fig.5 Decomposition of Variance of Funds



The results from this time-series analysis are presented in **Fig. 6**, together with the Brinson et al. results, Ibbotson et al. results, and Pension Fund Association results. The results, on average, confirm the results of the Brinson and Ibbotson studies that 89.9% of the variability of a fund's return over time is explained by the variability of a fund's policy return. It is clear that PAA significantly affects the return of Japanese domiciled asset allocation funds.

Fig.6 Explanatory Power of PAA for Time Series Variability of a Fund's Returns Over Time

Researcher	Universe	R^2 (%) Average	Standard deviation (%)	Percentile Minimum	5%	25%	50%	75%	95%	Maximum	Active Return (%) Average	Median	Beta Average	Median
Brinson(1991)	US pension funds	91.5	6.6	67.7	N.A	N.A	N.A	N.A	N.A	98.2	-0.08	N.A	N.A	N.A
Ibbotson(2000)	US pension funds	88.0	N.A	N.A	66.2	94.1	90.7	94.7	97.2	N.A	-0.44	0.18	N.A	N.A
Ibbotson(2000)	US mutual funds	81.4	N.A	N.A	46.9	79.8	87.6	91.4	94.1	N.A	-0.27	0.00	N.A	N.A
Pension Fund Association(2001)	Japanese pension funds	91.2	6.77	12.86	80.41	89.93	92.99	94.82	96.31	99.46	N.A	N.A	N.A	N.A
the present study	Japanese balanced funds	89.9	8.3	41.4	77.2	88.2	91.9	94.4	98.8	99.9	-0.08	-0.01	1.00	1.00
	FoFs	77.8	1.9	73.1	75.3	77.3	77.7	78.0	80.9	82.8	0.06	-0.10	1.00	0.98
	Active balanced funds	90.0	7.7	41.4	79.7	89.7	91.6	93.5	95.9	99.2	-0.17	-0.23	1.01	1.01
	Index balanced funds	96.3	4.6	82.1	83.4	96.6	97.7	98.7	99.4	99.9	0.19	0.20	0.98	0.98

Comparing the three types of funds, FoFs have a lower R^2 at 77.8% and would be more active compared to other types. This lower R^2 indicates that FoFs aim for more active returns by investing in higher active risk funds and by actively changing asset allocation. In contrast, index balanced funds have a higher R^2 at 96.3%. The higher R^2 indicates that index balanced funds' active risk is kept lower because they invest in indexes and also stick to the policy weight. On the other hand, even though the active balanced funds average R^2 was 90%, the minimum was extremely low at 41.4% and the maximum was extremely high at 99.2%. These results indicate that there are broad variations among active balanced funds.

(2) Variation of Return among Funds

Here I examine the explanatory power of PAA in terms of variation of return among funds. Since the Brinson et al. study is also often misinterpreted in Japan as to indicate variation in returns among funds, here I measure to what extent the difference in policy returns can explain the difference in returns through cross-sectional analysis in just the same way as Ibbotson et al. In other words, the returns of funds have broad variation of around 2-10% as shown in **Fig.2** and this analysis shows how much of this difference can be explained by the difference in policy returns.

First, I measure annual geometrical mean return before each fund's management fees (GMR (TRB_i)) and annual geometrical mean return of each fund's policy benchmark (GMR (PR_i)) for a six-year period (2002-07). Then, R^2 is calculated by cross-sectional regression analysis through equation (8) by setting GMR (TRB_i) as an explained variable and GMR (PR_i) as an explanatory variable.

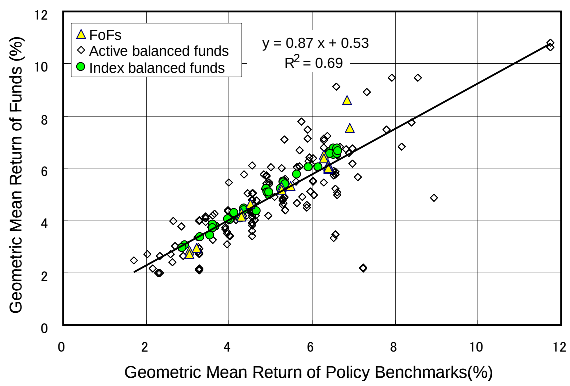
$$GMR(TRB_i) = \alpha + \beta \cdot GMR(PR_i) + \varepsilon_i \quad (i=1, 2, \ldots, 213) \qquad (8)$$

Fig.7 shows the scatter plots of the GMRs of 213 funds and the GMRs of their policy benchmarks, regression line, estimated regression equation, and coefficient of determination R^2 of the cross-sectional regression. This analysis indicates that 69% of the return difference was explained by policy return differences. This result is comparatively high compared to the result (40%) that Ibbotson et al. showed using US balanced mutual funds and the result (15%) of the Pension Fund Association [2001] using Japanese pension funds.

From this result, it can be assumed that the overall level of active risk of Japanese asset allocation funds is lower compared to the aforementioned funds. If active risk is small, the average return of the fund and policy benchmark would be close to the same level and they can be plotted near the 45 degree line. In fact, the R^2 of index balanced funds with small active risk was 99%, which explains almost totally that the return difference among funds comes from policy differences. By this result, what Ibbotson et al. predicted is proved—the less active a fund is, the higher the cross-sectional R^2 becomes. On the other hand, this analysis shows that 90% of return differences among FoFs and 63% for active balanced funds were explained by policy return differences.

From these results, it can be assumed that Japanese asset allocation funds do not aggressively take active risk or that active risk is restricted by the institution's investment policy compared to Japanese and US pension funds or US mutual funds. Also, this analysis shows that difference in investment style among each asset class or fund selection has little impact.

Fig.7 Geometric Mean Return of Funds and Policy Benchmarks (2002-07)



(3) Variation of Risk among Funds

Individual investors and investors who are sensitive to degree of risk need to select funds with appropriate risk level because of different risk tolerance reflecting individual circumstances such as wealth, experience, knowledge. If a fund's policy weight remains stable and the fund does not take large active risk with respect to each asset class, a fund's volatility risk level (hereinafter standard deviation) can be calculated by using three components—the expected standard deviation of each asset class, the estimated correlation coefficient between asset classes, and policy weight. However, is this assumption correct or not?

Therefore, here, I want to look at the explanatory power of PAA in terms of variation of risk (standard deviation) among funds. In other words, the standard deviations of funds have a broad variation of around 2-18% as shown in **Fig.2** and cross-sectional analysis measures to what extent differences in standard deviations of policy returns can explain differences in standard deviations of real returns.

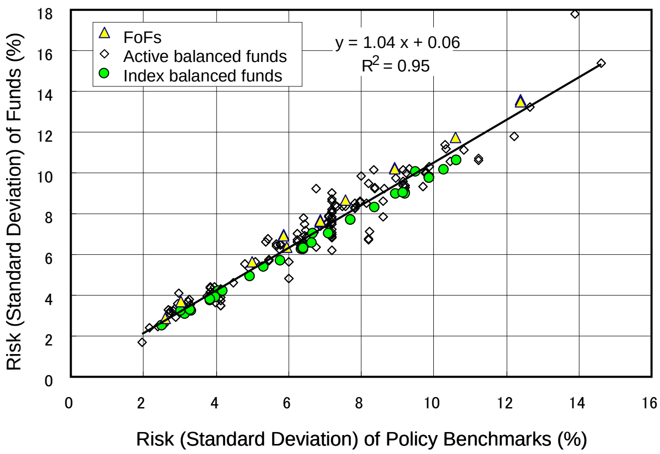
First, annual standard deviation of monthly return before each fund's management fees (Std (TRB_i)) and annual standard deviation of each fund's monthly policy return (Std (PR_i)) are measured for a six-year period (2002-07). Then, R^2 is calculated by cross-sectional regression analysis through equation (9) by setting the standard deviation of each fund (Std (TRB_i)) as an explained variable and the standard deviation of each fund's policy benchmark (Std (PR_i)) as an explanatory variable.

$$Std\,(TRB_i) = \alpha + \beta \cdot Std\,(PR_i) + \varepsilon_i \quad \text{(i=1, 2, …, 213)} \qquad (9)$$

Fig.8 shows the scatter plots of the standard deviations of 213 funds and the standard deviations of policy benchmarks, regression line, estimated regression equation, and coefficient of determination R^2 of the cross-sectional regression. The cross-sectional R^2 statistic of this regression showed that 95% of the variation of risk across funds was explained by policy. The difference in standard deviations among funds can mostly be explained by the difference in standard deviations of policy return.

Comparing the cross-sectional R^2 statistic, R^2 is at 99.5% for FoFs, 94% for active balanced funds, and 99.7% for index balanced funds. This indicates that for Japanese asset allocation funds, no matter what type, policy weights are assumed to be stable, active risk is low, and the standard deviation of a fund can be measured through the standard deviation level of the policy benchmark.

Fig.8 Risk (Standard Deviation) of Funds and Policy Benchmarks (2002-07)



(4) Return Level

To many people "the influence of asset allocation policy on performance" immediately means what portion of a fund's capital gain/loss over the medium-to-long term can be explained by asset allocation policy return. Ibbotson et al. said almost 100%. This means that when the average return of a certain fund was 8% over five years, the average policy return of the fund would be approximately 8%, too. This evidences the explanatory power of PAA in terms of a fund's average return level in the same way as Ibbotson et al.

First, annual GMR before each fund's management fees (GMR (TRB_i)) and annual GMR of each fund's policy benchmark (GMR (PR_i)) for a six-year period (2002-07) are measured. Then, the GMR ratio (GoG_i) can be computed through equation (10) as follows:

$$GoGi = GMR\ (PRi) \div GMR\ (TRBi) \qquad (10)$$

Second, the average, median, and distribution of the GMR ratio (GoG_i) for the 213 funds and the three types of funds are calculated.

This ratio (GoG_i) goes up to 100% if the GMR between fund and policy benchmark is the same, and if the fund outperformed/underperformed against policy return, it becomes lower/higher than 100%.

Fig.9 shows the explanatory power of PAA in terms of return level for Brinson studies, Ibbotson studies, the Pension Fund Association studies, and this report. On average, GMR of the policy benchmark is higher than GMR of a fund, and policy return accounted for 106% of the return of an individual fund.

Comparing the three types, FoFs is at 102%, active balanced funds 108%, and index balanced funds 99%, which shows it was difficult for both FoFs and active balanced funds to add value above policy return even before management fees, because of security and fund selection, asset class timing, and investment expenses. On the other hand, there are two reasons for the broad distribution range of active balanced funds. One is that there is a big difference in the degree of active management of each fund, and the other is that there are funds with the denominator being less than 1% average return and even the difference between the numerator and the denominator is not broad, this ratio (GoG_i) becomes bigger.

Fig.9 Explanatory Power of PAA for Return Level

(%)

Researcher	Universe	Average	Minimum (best)	5%	25%	50%	75%	95%	Maximum (worst)
Brinson(1991)	US pension funds	101	N.A	N.A	N.A	N.A	N.A	N.A	N.A
Ibbotson(2000)	US pension funds	99	N.A	86	96	99	102	113	N.A
Ibbotson(2000)	US mutual funds	104	N.A	82	94	100	112	132	N.A
Pension Fund Association(2001)	Japanese pension funds	115.71	73.90	100.51	111.39	116.65	120.47	127.53	181.70
the present study	Japanese balanced funds	106	67	79	94	101	110	132	335
	FoFs	102	79	92	100	104	106	110	111
	Active balanced funds	108	67	75	91	104	115	153	335
	Index balanced funds	99	94	96	97	98	100	103	107

(5) Risk Level

Lastly, the explanatory power of PAA in terms of risk (standard deviation) level. The coefficient of determination produced by the regression analysis explained in section 5(1) was a variance ratio of policy return against the variance of a fund's beta adjusted return, but this section shows the ratio of risk (standard deviation) level of policy return against the risk (standard deviation) level of a fund's return.

First, the annual standard deviation of monthly return before each fund's management fees (Std (TRB_i)), and annual standard deviation of monthly return of each fund's policy return (Std (PR_i)) for a six-year period (2002-07) are measured. Then, the standard deviation ratio of policy benchmark (SoS_i) against the standard deviation of the fund is calculated through equation (11).

$$SoSi = Std\ (PRi) \div Std\ (TRBi) \qquad (11)$$

Second, the average, median, and distribution of the standard deviation ratio (SoS_i) of the 213 funds and the three types of funds are calculated. From equation (7) in section 5(1), this standard deviation ratio (SoS_i) can be explained as below:

$$\frac{\sigma_{PR_i}}{\sigma_{TRB_i}} = \frac{R_i}{\beta_i} \quad (12)$$

As a result, this would be the beta adjusted time-series correlation coefficient for policy return and the fund's return. Since the R^2 measured in section 5(1) was 90% on average and β_i was 1.0, this standard deviation ratio SoS_i can be considered to be approximately 95%.

Fig.10 shows to what extent policy benchmark can explain risk level. On average, policy benchmark risk accounts for 95% of the risk level of an individual fund, as was projected. Comparing the three types, FoFs is at 89%, active balanced funds 95%, and index balanced funds 100%. These values are almost the same level as those substituting the square root of R^2 and β mentioned in section 5(1) into the right side of equation (12).

Through this result, the risk level of a fund can be explained by the risk level of PAA, no matter the fund type.

Fig.10 Explanatory Power of PAA for Risk Level (2002-07)

(%)

Universe	Average	Minimum	5%	25%	50%	75%	95%	Maximum
Japanese balanced funds	95	73	82	90	95	101	109	125
FoFs	89	82	82	88	90	90	92	93
Active balanced funds	95	73	82	90	95	99	113	125
Index balanced funds	100	93	95	100	101	102	103	103

6. Active Risk/Return of Asset Allocation Funds

Many previous empirical studies have reported that the performance of the majority of active funds that invest in a single asset class normally underperformed the benchmark. It is considered more beneficial to invest in index balanced funds with relatively low management fees, or combine index funds or ETFs of each asset class as a portfolio than to invest in FoFs or active balanced funds with relatively high management fees because it is difficult for asset allocation funds to outperform the policy return.

From this study, it can be assumed that the PAA for an asset allocation fund almost explains fund performance, and there is a limit to achieving excess return. What is the active return level or active risk level of asset allocation funds?

Fig.11 shows how much active return was achieved by each fund type over a six-year period (2002-07).

Fig.11 Active Return for Asset Allocation Funds (2002-07)

	Japanese balanced funds		FoFs		Active balanced funds		Index balanced funds	
	Before cost	After cost	Before cost	After cost	Before cost	After cost	Before cost	After cost
Number of funds	213	213	22	22	151	151	40	40
Number of funds that outperformed policy return	103	9	6	1	65	8	32	0
Percentage of funds that outperformed policy return	48%	4%	27%	5%	43%	5%	80%	0%
Number of funds that underperformed policy return	110	204	16	21	86	143	8	40
Percentage of funds that underperformed policy return	52%	96%	73%	95%	57%	95%	20%	100%
Average active return (%)	-0.11	-1.32	-0.05	-0.99	-0.17	-1.56	0.07	-0.57
Median active return (%)	-0.04	-1.17	-0.20	-0.84	-0.20	-1.49	0.10	-0.54
Standard deviation of active return (%)	0.87	1.02	0.45	0.62	1.01	1.08	0.11	0.27

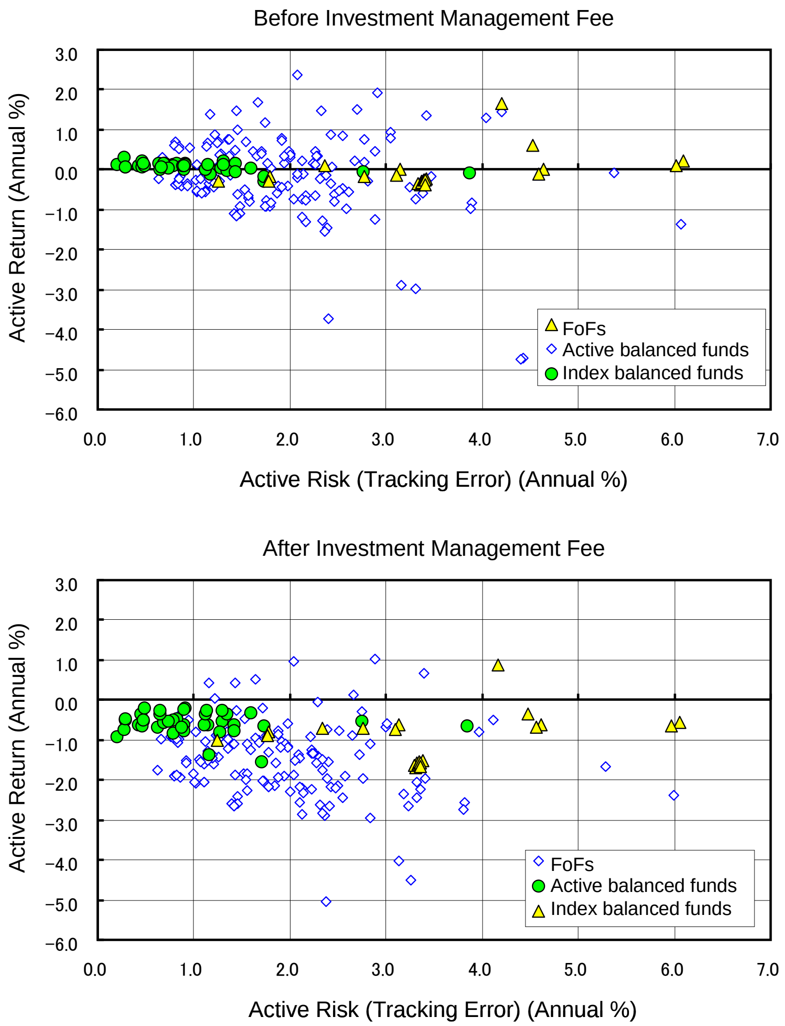
On average, the annualized active return of asset allocation funds was minus 1.32% after management fees and the number of funds that outperformed the policy return was only 4% of the total. However, before the deduction of management fees, annualized active return was minus 0.11%, and the number of funds that outperformed and underperformed was about the same. Comparing each type, 27% of FoFs and 43% of active balanced funds outperformed before management fees and those funds have shown good judgment.

However, it became clear that it is extremely difficult to generate positive active return after the deduction of management fees (note that investors have to pay the cost of replicating the PAA through index funds). Based on this result, the appropriate level of investment management fees should be a topic of discussion for investors.

These results do not indicate whether it is advantageous to hold active balance funds or to combine index funds because even though there are only few funds outperforming policy return, funds able to achieve positive active return actually do exist. If investors have the ability to select those superior funds, they may enjoy the good performance of active investment.

Fig.12 shows six years of annualized active return and active risk before and after investment management fees from 2002 to 2007. The slope through origin to each fund is the information ratio (hereinafter IR).

Fig.12　Active Risk and Active Return of Asset Allocation Funds (2002-07)

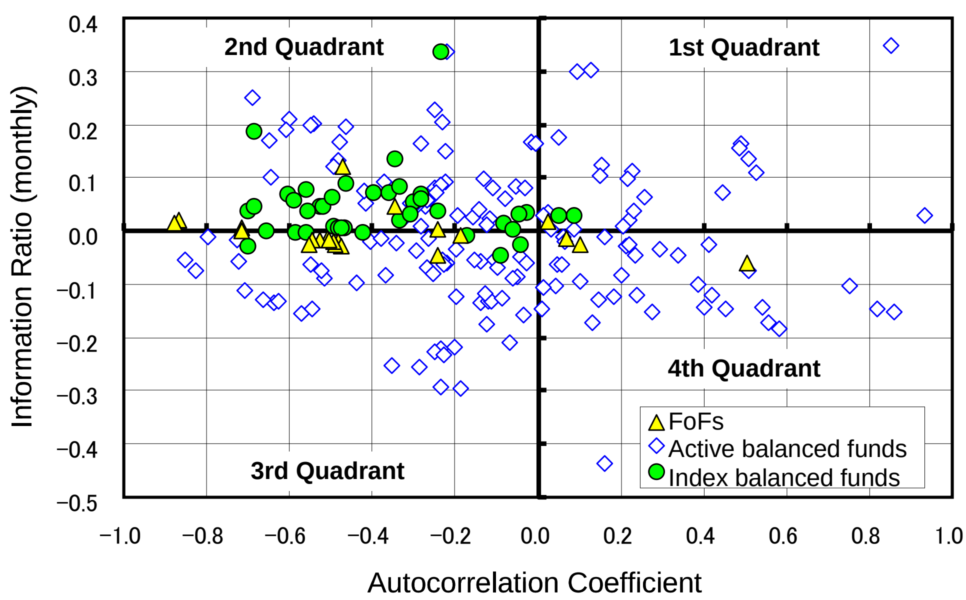


Reviewing the relation of active risk and active return before investment management fees, the range of active return for active balanced funds is wide, and the range of active return for FoFs and index balanced funds is narrow. For active balanced funds, active risk-return trade-offs can be seen, so active return depends on active risk. This means that there is an upper limit to IR. On the other hand, FoFs and index balanced funds have not achieved active return relating to active risk. Maximum IR before investment management fees for this analysis period was 0.4 (monthly 0.12) for FoFs, 1.2 (monthly 0.35) for active balanced funds, and 1.2 (monthly 0.34) for index balanced funds.

Fig.13 is a scatter plot showing the autocorrelation coefficient on the horizontal axis, and IR on the vertical axis to classify the ability to generate positive active return. In the first quadrant, both IR and autocorrelation are in the plus area and this would be the most promising universe that is expected to continuously outperform. In the second quadrant, IR is in the plus area, and the autocorrelation coefficient is in the minus area, and this would be the universe which is expected to outperform after repeating winning or losing policy return. In the third quadrant, both IR and autocorrelation are in the minus area and this would be the universe that has the high possibility of underperforming after repeating winning or losing policy return. In the fourth quadrant, IR is in the minus area, and the autocorrelation coefficient is in the plus area, and this would be the universe which investors should avoid selecting because it tends to continue to underperform.

Fig.13 shows that the first quadrant, which investors expect to be the most promising universe, has only a small number of funds, and it is difficult for investors to select the continuous value-added fund.

Fig.13 Autocorrelation Coefficient and Information Ratio of Active Return (2002-07)



Still note that in order to evaluate investment management skills for a fund statistically based on a quantitative performance attribution such as this scatter plot, a long-term performance record is needed. Even if statistical tests indicate that a fund enjoys superior investment management skills based on the past record, investors should remember that there is no guarantee that excellent performance in the past can be repeated in the future.

7. Conclusion

Through this study, the explanatory power of PAA with respect to asset allocation funds for Japanese open-ended public investment depends on type of funds such as 1) FoFs, 2) active balanced funds, and 3) index balanced funds. On average, it is (1) about 90% for the time series variability of a fund's returns over time, (2) about 70% for the variation of return among funds, (3) about 95% for the variation of standard deviation (risk) among funds, (4) about 106% for the return level, and (5) about 95% for the standard deviation (risk) level. PAA has a large impact on a fund's performance in all of these five aspects, and it is clear that return level and risk level of Japanese mutual funds can be explained by PAA.

Also, annualized average active return of an asset allocation fund was minus 1.3% after investment management fees and minus 0.1% before investment management fees, showing that the number of funds that outperformed and those that underperformed was about the same.

The results demonstrate the importance of how policy asset allocation is formulated, namely, they indicate the importance of selecting asset class and constructing policy weights based on expected return, expected risk, and correlation between asset classes from a long-term perspective, and the importance of individual fund selection based on active risk tolerance.

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