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Strategic Asset Allocation and Active Management: Evidence from Moroccan Pension Funds

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ABSTRACT

The **subject** of the study is to evaluate the contribution of strategic asset allocation to the variability of Moroccan pension funds performance. The **aim** of the paper is to identify the role of active management factors, namely tactical allocation and security selection, in generating a performance surplus compared to strategic allocation. The **relevance** of the study is justified by the need to identify the sources of performance creation in order to face the commitments of Moroccan pension funds and to compensate for the decline and volatility of asset returns. The article addresses, through the use of simple linear regression **methods**, the relative importance of strategic asset allocation in explaining the variability of the performance of Moroccan pension funds. It introduces a **scientific novelty** through the use of the "performance attribution" method. The **conclusions** of the paper confirm the main role of strategic asset allocation, which varies according to the size of the fund, the asset classes, and the risk aversion of the manager.

Keywords: strategic asset allocation; active management; linear regression; performance attribution; Moroccan pension funds

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INTRODUCTION

The pension fund investment decision-making process is based on three main steps: strategic asset allocation, tactical asset allocation, and security selection. The first one consists of allocating investments among different asset classes according to their level of return and risk [1]. It is similar to a buy-and-hold strategy, as opposed to tactical allocation, which aims to make short-term bets against strategic weightings. Both methods are based on modern portfolio theory, which emphasizes diversification to reduce risk and increase portfolio returns. The last step is the actual construction of the portfolio based on the selection of stocks according to the expectations of their price evolution.

Strategic asset allocation is downstream of the asset and liability management process and upstream of portfolio construction. It is guided by the liabilities and expectations of returns and risks of each asset class [2]. It is expressed as a benchmark that serves as a reference for managers. The question that arises is whether they will duplicate it or take bets on asset classes or securities by deviating from the strategic weights. Replicating the benchmark or passive management means achieving the same performance. It is opposed to active management which seeks to beat the benchmark by taking advantage of the opportunities offered by the different markets [3].

After setting the strategic asset allocation, managers build investment portfolios based on fundamental and technical analysis of markets and securities. They focus on the specificities of each company and its growth potential. It requires regular monitoring of events that may impact the profitability and solvency of companies.

The contribution of these three steps to performance is a subject of debate for pension funds and other institutional investors. It is raised by both theoretical and practical considerations. On the theoretical aspect, studies confirm the main role of strategic asset allocation in explaining the variation in the performance. On a practical aspect, asset management companies advertised their skills and innovative techniques to achieve better returns. Part of their revenues depends on the effort employed to outperform the benchmark.

According to the preceding debates on the contribution of strategic asset allocation and active

management in creating performance, we attempt to answer the following question: Does strategic asset allocation alone guarantee the achievement of management objectives or should active management be called for?

This article aims to answer this question through a two-level analysis: the first is the examination of the contribution of strategic asset allocation in explaining the variation in the performance of Moroccan pension funds. This contribution was analyzed in terms of three variables: fund size, asset classes, and the level of risk taken by the manager. The second level of analysis focused on the performance of one of the funds, which was analyzed using the "performance attribution" method in order to isolate the effects of active management and verify their correlation with the fund's performance.

LITERATURE REVIEW

The study published by Brinson et al. (1986) [4] provided an initial analytical framework for measuring and determining the contribution of strategic asset allocation and active management to the variation in the performances of American pension funds. A regression of the return series yielded an average coefficient of determination (R-square) of 93.6%, which led the authors to conclude that 93.6% of the variation in quarterly portfolio performance is explained by the regression model. The other factors, i.e. tactical allocation and security selection, contribute little to improving the returns of managed funds [5].

These findings have been observed in other countries and markets beyond the United States. German and Swiss balanced mutual funds [6, 7], Canadian, British and Australian funds [8], or Spanish pension funds invested in Eurozone or global equities have displayed the same findings [9].

The explanation of the variation in performances over time and between funds has been addressed by Ibbotson and Kaplan (2000) [10]. Their study concluded that asset allocation accounted for 90% of the variation in fund's performance over time and only 40% of the variation in performances between funds. The remaining 60% is explained by other factors, such as market timing, security selection, and fees.

Drobetz and Köhler (2002) [6] proposed a method based on the calculation of an average allocation return ratio by relating the benchmark return to the fund's total return.[1] The authors arrived at an average ratio of 134% and a median ratio of 131%. Compared to the results obtained by Brinson et al (1986, 1991) [4, 5]and Ibboston and Kaplan (2000) [10], the authors concluded that active management significantly destroyed performance and that the quality of active management in the Swiss and German sample is lower than in the American sample. These two findings confirm that active management has a significant influence on overall fund performance and is an important factor that should not be neglected alongside strategic asset allocation. Similarly, Tokat (2006) [11] argues that while active management would negatively impact returns and volatility, it offers managers the opportunity to outperform the benchmark. He recommends building a strategic portfolio tailored to the specific constraints of each investor and unearthing excess performance by diversifying asset portfolios and minimizing implementation costs.

Strategic asset allocations, while important, face the problem of market dynamics and opportunities [12]. It also depends on the chosen benchmark and subsequently on the investor's risk aversion and time horizon [13]. According to Hoernemann et al. (2005) [14], market movements should be considered as an explanatory element of the variation in the performance. The authors concluded that strategic asset allocation accounts for an average of 77.5% of the variation in portfolio performance.

In the same vein, Aglietta et al. (2012) [15] discussed the need to consider strategic asset allocation in the asset/liability management process. They outlined the contribution of strategic asset allocation based on a sample of 143 US defined benefit pension funds from 1990 to 2008. Using a very detailed database, the authors conclude that 80% of the variation in fund's performances is explained by market movements, in contrast to the work of Brinson et al. (1986, 1991) [4, 5] and Ibbotson and Kaplan (2000) [10]. The authors used two methods to estimate the market return. For sample A, they used the average return of all pension funds

[1] According to the authors, if the ratio (benchmark return / fund return) is equal to 100%, then the manager practices passive management by duplicating the same benchmark weightings. In this case, his R-square will be equal to 100%.

in the sample. While for another sample B, the return was estimated from the market indices.[2]

Strategic asset allocation allows to orient investments and defines the levels of return and risk. It should not be static and fixed, creating rigidity in its implementation. On the contrary, it should be dynamic and [2, 16].

These findings mostly concerned developed markets with high volatility and liquidity, what about other less dynamic markets? The study conducted by Baş and Sarioğlu (2018) [17] covered the Turkish market which is fundamentally different from developed markets. The authors claimed, based on 62 Turkish pension funds and over two different time periods (5 and 10 years), that price changes dominate other effects with 98% for funds invested in equities and 89% for balanced funds.

Funds with particular themes were also discussed. Peillex et al. (2018) [18] worked on a sample of 281 Islamic equity funds. These funds are characterized by restrictions on investment products in accordance with religious beliefs. They have a very narrow investment universe, less balanced and less speculative. The authors conclude that market movements explain 74 to 93% of the variation in fund performance, asset allocation policy accounts for 18% to 20%, while active management accounts for 10% to 26%.

DATA AND METHODOLOGY

We Studied 29 Moroccan[3] mutual funds, presented in detail in *Appendix* (*Table 1*). The assets managed by these funds represent 70% of the total investments[4] of Moroccan pension funds. The funds are distributed as follows: 5 stock funds, 22 bond funds, and 2 balanced funds. For the stock funds, the allocation consists in dividing the investments between the economic sectors, while for the bond funds, the allocation is built according to the residual[5] maturity strata. Finally, balanced funds use two levels of diversification: asset classes and economic sectors or maturity strata.

To analyze the performance and effects of the bets at the time of their implementation, we used weekly observations over the period from January 3, 2014 to December 25, 2020, i.e. 363 weekly net asset values (NAV) provided by "Six Financial Information".[6] For the strategic asset allocations, we used the elementary indices of both stock and bond markets to calculate the benchmark performances. For the stock market, we used the Moroccan All Stocks Index (MASI) and the Moroccan All Stocks Index Return (MASIR). For the bond market, we used the Moroccan Bond Index (MBI) and its sub-indices: MBI Short Term (MBICT), MBI Medium Term (MBIMT) MBI Medium and Long Term (MBIMLT) and MBI Long Term (MBILT).

We have calculated, in the same period, weekly performances, for the fund and its benchmark. The performance is determined by the structure of the portfolio, which integrates market fluctuations, strategic allocation, and active management decisions. The performance of the benchmark considers the structure of the allocation and asset prices [1].

For a fund ***P*** and its benchmark ***B***, we used the following ratings:

- The time series of fund performance:

$$r_t^P = \ln \frac{NAV(t)}{NAV(t-1)} \text{ for } t\text{: } 2\ldots n \text{ where } NAV(t) \text{ is the}$$

net asset value of the fund ***P*** at date *t* and *n* is the number of *NAV*.

- The time series of benchmark performance:

Each fund's published prospectus provides information on its benchmark.[7] For Moroccan mutual funds, the benchmark corresponds to an elementary index or a composite of two indices. We have calculated the performance of the benchmarks by weighting the performance of the elementary indices by the strategic weights. As an illustration, for a composite benchmark of two indices (index$_1$ and

[2] MSCI World for equities and JP Morgan Global Aggregate Bond Index US for bonds and a composite of 65% equities and 35% bonds for diversified portfolios).

[3] Pension funds in Morocco are not required to publish detailed financial information. For this purpose, we used the mutual funds created for pension plans which, on the other hand, are obliged to publish their net asset values on a weekly basis, at least.

[4] The total investments of pension funds reached 259.3 billion MAD at the end of 2019. Source: Activity Report 2019, Supervisory Authority of Insurance and Social Welfare (ACAPS). URL: https://www.acaps.ma/en/publication/rapports-et-publications

[5] Short term (< 1 year), medium term (2–5 years), medium and long term (5–10 years) and long term (> = 10 years).

[6] URL: http://www.six-financial-information.com/

[7] From the web site of Moroccan Capital Market Authority. www.ammc.ma

index$_2$) with respective weights w and (1-w), we have calculated an index that captures, at each date, w of the first index and (1-w) of the second index. This is how we calculated the series of performances of the strategic allocations according to the following formula:

$$r_t^B = w \ \ln\frac{Index_1(t)}{Index_1(t-1)} + (1-w)\ln\frac{Index_2(t)}{Index_2(t-1)}.$$

$t = 2,3,\ldots, n.$

- The coefficient of determination for each fund is calculated according to the following formula:

$$\text{R-square} = \sum_{t=1}^{n}\left(\widehat{r_t^P} - \overline{r^P}\right) / \sum_{t=1}^{n}\left(r_t^P - \overline{r^P}\right).$$

Where $\widehat{r_t^P}$: predicted fund return predicted by regression model of fund performances against the benchmark.

And $\overline{r^P} = \frac{1}{n}\sum_{t=1}^{n}\left(r_t^P\right)$: The average observed return of the fund.

The R-square measures the proportion of variability explained by the regression model. If the R-square is high (close to 100%), then the regression curve fits the data well. However, if it is low, we can understand that other explanatory variables can be added to the model [19, p. 133–134]. In our case, tactical allocation and security selection are potential explanatory variables.

- Tracking error (TE) is a measure of relative risk taken by a fund compared to its benchmark. In general, the promoter of a fund sets a risk budget measured by the tracking error to give the manager margin of freedom and at the same time to frame his exposure to risk [20]. It is calculated as the standard deviation of performance differences between a fund and its benchmark:

$$TE = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}\left(\Delta r_t - \overline{\Delta r}\right)^2}$$ Where: $\Delta r_t = r_t^P - r_t^B$ and

$$\overline{\Delta r} = \frac{1}{n}\sum_{t=1}^{n}\left(\Delta r_t\right).$$

To explain the variability in performance by strategic asset allocation, we performed a simple regression of the fund's performance against the benchmarks [15], calculated and analyzed coefficients of determination R-square.[8] The calculations were also redone taking into consideration three differentiating variables, namely: the category of the funds (stock, bond or balanced), the fund size [21], and the level of the tracking error [22, 23].

The second question, which concerns the contribution of active management, has been approached on two levels. First, is to assess the performance surplus between the fund and its benchmark by calculating and analyzing the ratio "*performance gap between fund and benchmark / fund performance*" called $Contrib_{AM}$.

$$Contrib_{AM} = \left(\frac{r_t^P - r_t^B}{r_t^P}\right) \times 100.$$

The second level consists in using the "performance attribution" method of Brinson and Fachler (1985) [24], which consists of isolating the effects of active management decisions, namely: tactical allocation, selection, and interaction.

The tactical allocation measures the difference in the performance of the asset class compared to the overall performance of the benchmark. It reflects the impact of the decision to overweight or underweight an asset class compared to its weight in the benchmark. Security selection measures the performance gap linked to the choice of securities within an asset class. Finally, Interaction is explained by the intersection of the two effects.

Performance attribution requires the availability of actual data on asset class weights and performance [4]. That's why the analysis was restricted to one of the mutual funds (F29) for which we were able to obtain all the necessary information. The correlation was calculated between each asset management factors and fund's performance.

Consider, for a portfolio ***P*** and its benchmark ***B***, the following ratings:

r_i^P : Return of class i in the portfolio ***P***

w_i^P : Weight of class i in the portfolio ***P***

[8] Hoernemann et al (2005) proposed using the standard deviation of fund returns to track return variability instead of the R-square. The standard deviation thus makes it possible to construct a confidence interval around the mean to track the variability of returns.

r^P: Portfolio ***P*** return = $\sum_{i=1}^{n} w_i^P r_i^P$

r_i^B : Return of class *i* in the benchmark ***B***

w_i^B : Weight of class *i* dans le benchmark ***B***

r^B: Benchmark ***B*** return = $\sum_{i=1}^{n} w_i^B r_i^B$

N: The number of asset classes

The performance gap: $\Delta r = r^P - r^B$ (1) can be broken down as follows:

$$\Delta r = \sum_{i=1}^{N} (r_i^P w_i^P - r_i^B w_i^B).$$

We can finally write:

$$\Delta r = \sum_{i=1}^{N} (w_i^P - w_i^B)\left(r_i^P - r^B\right) +$$

$$+ \sum_{i=1}^{N} w_i^B \left(r_i^P - r_i^B\right) + \sum_{i=1}^{N} (w_i^P - w_i^B)\left(r_i^P - r_i^B\right)$$

$$\text{or } \Delta r = \sum_{i=1}^{N} (A_i + S_i + I_i) \qquad (2)$$

With:

$A_i = \left(w_i^P - w_i^B\right)\left(r_i^P - r^B\right)$: Tactical allocation effect

$S_i = w_i^B \left(r_i^P - r_i^B\right)$: Security selection effect

$I_i = (w_i^P - w_i^B)\left(r_i^P - r_i^B\right)$: Interaction effect

Thus, from equality (1) and (2), we deduce the breakdown of the portfolio's profitability according to the different effects: $r^P = r^B + A + S + I$ with

$A = \sum_{i=1}^{N} \left(A_i\right)$: Performance linked to tactical allocation bets.

$S = \sum_{i=1}^{N} \left(S_i\right)$: Performance linked to the choice of securities.

$I = \sum_{i=1}^{N} \left(I_i\right)$: The part of the performance explained by the interaction between the two effects tactical allocation and security selection

For simplification purposes, interaction effect and selection effect were grouped (*S*+*I*) and noted as (S'). The regression of the fund performance will be done, this time, with each of the three explanatory variables: strategic asset allocation (r^B), tactical allocation (A) and selection (S').

RESULTS AND DISCUSSION OF PERFORMANCE VARIABILITY

The first results of the calculation of absolute and relative performance, detailed in *Appendix* (*Table 1*), show that the average annualized performance of the funds is 5.4% compared to 4.9% for their benchmarks. 72.4% of the funds recorded an outperformance between 30 and 440 basis points (bps), while 27.6% of the funds underperformed between –220 and –20 bps. The contribution of strategic allocation to performance represents on average 92.2%. The contribution of active management, as measured by the $Contrib_{AM}$ ratio, was 24.7% for funds that outperformed their benchmark and –16.6% for those that underperformed.

Regarding the impact of strategic asset allocation on the variability of fund performance over time, the average R-squared is 81.7% (*Table 1*). This is lower than those obtained by Brinson et al. (1986, 1991) [4, 5].[9] The calculation of the coefficient of determination R-square gives disparate results between funds. This result is explained by the heterogeneity of the funds in terms of strategic allocation, size, and asset class.

The concentration of R-square (*Fig. 1*) shows that 75.9% of the funds have a coefficient greater than 80%, attesting to the importance of strategic asset allocation for the majority of the funds. It is important to note that one fund has an R-square equal to 27.4%. This fund will be analyzed to answer the second question of the study.

Another finding from the results in *Appendix* (*Table 1*) is that funds with the same benchmark do not necessarily have the same R-square. This confirms that managers implement their portfolios differently and use active management techniques in order to beat their benchmark. *Table 2* presents data for two funds with the same benchmark but mandated to different managers in the stock category.

We note that the two stock funds show slightly different R-square with a return advantage for the

[9] See Appendix (*Table 2*).

(F3) fund against a higher tracking error of 0.7%. Both funds have outperformed the benchmark, demonstrating the additional value creation which, represents 21.2% and 13% respectively for the (F3) and (F1) in fund performance.

Similarly, for the bond funds, *Table 3* presents data for three funds with the same benchmark.

The three funds are managed under the same strategic asset allocation constraints. They have the same benchmark but the management style and results are not the same. The (F16) and (F21) funds show the same performance while their R-squares are different. The two other funds (F21) and (F22) showed close R-square but significant differences in performance. While the former outperformed the MBI by 56 pbs, the latter underperformed by 16 bps.

After this overview, we will present results highlighting three differentiating factors that we consider important in explaining the variability in the performance, namely: fund category, asset size, and the level of ex-post risk measured by the tracking error.

For three categories of funds, we present the coefficients of determination in *Table 4*.

The results show an average R-square of 94.5% for equity funds and 54.9% for balanced funds. For bond funds, this coefficient varies between 32% and 97% with an average of 81.2%. We can deduce that the asset class of a fund has an influence on the variability of its performance.

Regarding the impact of the fund size on the R-square. We expect small funds to show a relatively low R-square. Indeed, these funds could deviate significantly from their benchmark index in order to take full advantage of the opportunities offered and readjust their allocation in the event of a market trend reversal. However, the results obtained (*Table 5*), show that the R-square of some large funds (+5 billion dirhams) is lower than those of small assets. These funds are invested in treasury bills and private debt with a risk premium not included in the Moroccan Bond Index.[10]

Finally, the third factor that influences the divergence of R-square is the degree of weighting mismatch between the fund and its benchmark. This mismatch, measured by the tracking error, is a deliberate decision taken by the manager according to his risk aversion and the leeway granted to him

Table 1

Min, Max and average of the R-square

Measure	R-square, %
Min	23.5
Max	97.0
Average	**81.7**

Source: authors' calculations.

[10] The Moroccan Bond Index (MBI) is calculated solely on the basis of Treasury bills. It does not include corporate bonds.

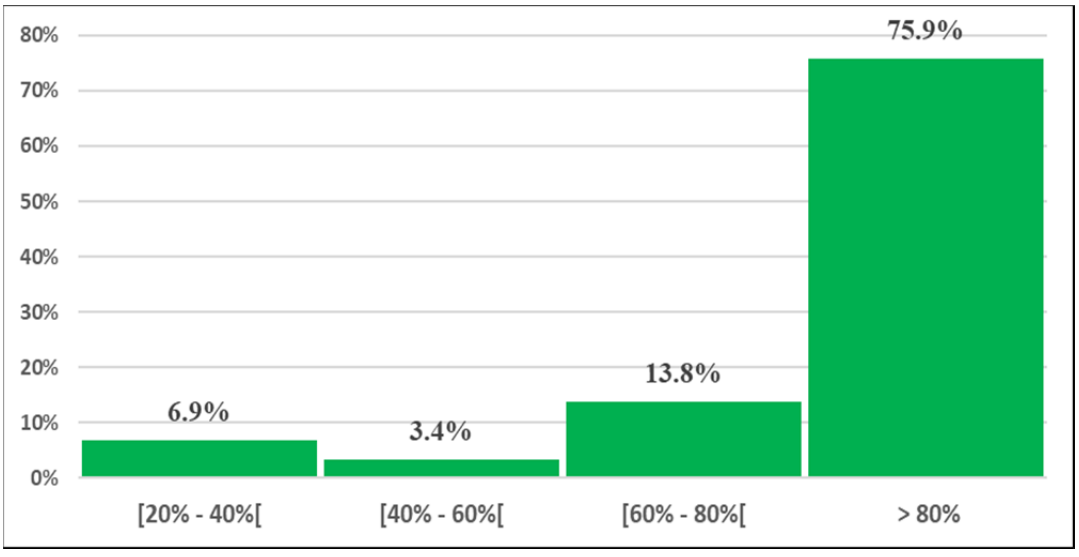

Fig. 1. **R-square concentration range**

Source: compiled by the authors.

Table 2

Performance and risk indicators for two stock funds with the same benchmark

Stock funds	F1	F3
Benchmark	MASI R	MASI R
Average size in Million MAD	705.3	836.3
R-square	96.4%	93.5%
Tracking error	2.0%	2.7%
Average annualized fund performance	7.7%	8.5%
Performance average annualized benchmark	6.7%	6.7%
Performance gap in basis points (bps)	102	176

Source: authors' calculations.

Table 3

Return and risk indicators for tree bond funds with the same benchmark

Bond funds	F16	F21	F22
Benchmark	MBI	MBI	MBI
Average size in million MAD	5 945.1	4 463.8	529.1
R-square	96.5%	84.3%	85.1%
Tracking error	0.7%	0.9%	0.8%
Average annualized fund performance	5.9%	5.9%	5.2%
Average annualized benchmark performance	5.3%	5.3%	5.3%
Performance gap in basis points (bps)	56	56	–16

Source: authors' calculations.

Table 4

Min, max and average R-square by fund category, %

Category	R-square Min	R-square Max	R-square Average
Stock	91.2	96.9	94.5
Bond	32.0	97.0	81.2
Balanced	23.5	86.4	54.9

Source: authors' calculations.

Table 5

Min, Max and mean of R-square according to fund size, %

Fund size	R-square Min	R-square Max	R-square Average
< 500 million MAD	23.5	95.7	71.5
[500 million – 1 billion MAD[	32.0	96.9	84.0
[1–5 billion MAD[	47.2	97.0	83.4
> 5 billion MAD[	61.6	86.4	74.0

Source: authors' calculations.

Table 6

Min, max and average R-square according to category and tracking error level

Category	Tracking Error	R-square min %	R-square Max, %	R-square Average, %
Stock and Balanced fund	Less than 2%	86.4	96.9	92.9
	More than 2%.	23.5	95.7	76.0
Bond fund	Less than 1%.	86.2	97.0	91.9
	More than 1% of the total	32.0	93.7	76.6

Source: authors' calculations.

by the fund promoter.[11] *Table 6* shows the results obtained for the two categories "equity and balanced funds" and "bond funds".

The greater the tracking error, the lower the coefficients of determination. For both categories, the R-square show significant differences depending on the risk budget consumed by each manager.

Overall, the analysis of the performance and risk of the funds studied shows that strategic asset allocation accounts for most of the performance. Also, for some funds, active management has been beneficial, creating a performance surplus but with a higher level of risk relative to the benchmarks. On the other hand, we note that for other funds, active management had a negative impact on performance.

RESULT AND DISCUSSION OF ACTIVE MANAGEMENT CONTRIBUTION

Contrib$_{AM}$ Ratios

The results of the calculation of the "*Contrib*$_{AM}$" ratio, summarized in *Table 7*, show that all the funds recorded performance gaps with their benchmarks.[12] Some managers (22 out of 29) took advantage of their bet against the strategic allocation and generated an average surplus equivalent to 17.7% of the fund's performance. Note that this surplus exceeded 48% for one of the studied funds (F29). On the other hand, some funds suffered losses relative to their benchmark, representing an average of –23.6% of the overall performance.

The contribution of active management in explaining the performance of the studied funds

[11] In general, the promoter of an investment fund sets a risk budget measured by the value-at-risk or tracking error to give the manager room for manoeuvre and at the same time to frame his exposure to risk.

[12] In practical terms, benchmarks are generally difficult to reproduce due to the lack of liquidity of certain assets on the one hand, and on the other hand due to the existence of a cash pocket in the fund to cover redemptions and the payment of management fees.

Table 7

Contribution of active management, %

	ContribAM		
	Min	Max	Average
Funds that outperformed their benchmark	3.3	48.5	17.7
Funds that underperformed their benchmark	−58.6	−3.1	−23.6

Source: authors' calculations.

Note: For more details, see *Appendix* (*Table 1*).

Table 8

Fund (F29) performance and risk Indicators, %

	Average Annualized Return	Standard deviation	Tracking error
Fund (F29)	7.9	6.2	6.3
Benchmark	4.8	2.8	

Source: authors' calculations.

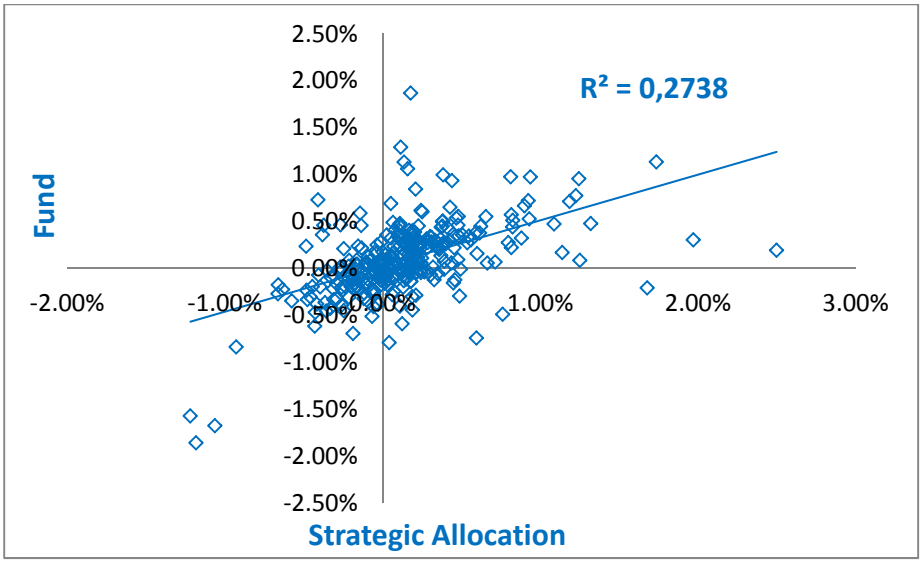

Fig. 2. **Scatter plot of fund returns (F29) versus benchmark**

Source: compiled by the authors.

has just been confirmed. The dispersion of results between funds is explained by the ability of managers to anticipate market behavior. It is also linked to the possibility of arbitrage between the markets.

Performance Attribution Results

The performance attribution analysis was applied to the fund (F29) for which we calculated the contribution of the active management factors to the performance. The calculation of the return and risk indicators of this fund is presented in *Table 8*.

We note that the fund has outperformed its benchmark by more than 3% on average per year with a much higher level of risk. The tracking error is considered high for a pension fund that is supposed to be backed by its liabilities.

Willing to outperform the benchmark by active management factors is increasing the risk-taking level. The risk cannot be ignored in explaining performance and performance its gap to the benchmark.

Table 9

Fund Performance Attribution (F29)

Source of performance		Performance, %
Strategic asset allocation		4.84
Effects of active management	Tactical Allocation	–0.50
	Security Selection	3.08
	Interaction	0.49

Source: authors' calculations.

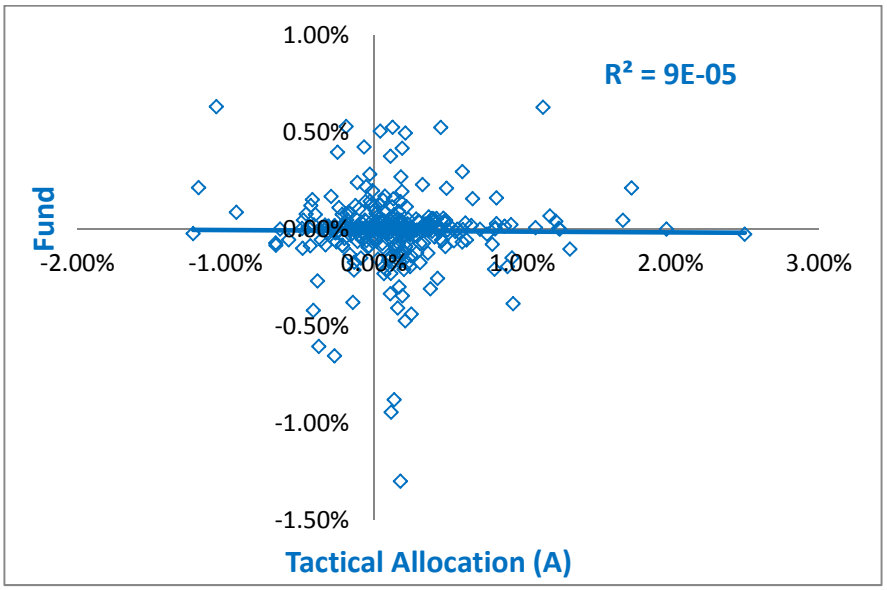

Fig. 3. **Scatter plot of fund returns (F29) versus tactical allocation returns**

Source: compiled by the authors.

Another factor, not the least, is the size of the funds compared to the transactional volume and the abundance of opportunities in a given market. The fund (F29), because of its relatively small size compared to the daily volumes on both the stock and bond markets, has been able to beat its benchmark over several years, sometimes, with a very high spread.

As regards the analysis of the variability of the fund's performance, we have plotted, in *Fig. 2*. the scatter plot between the performance of the benchmark and that of the fund. The regression gave an R-square of 27.4%. This result led us to conclude that the performance of the strategic allocation only weakly explains the variability of the fund's performance (F29).

The results of the application of the attribution performance method [23] allowed us to divide the performance gap in three effects: tactical allocation, selection, and interaction. The results summarized in *Table 9* indicate that security selection generated an average performance of 3.08% compared to 4.84% for the strategic allocation.

The performance surplus was generated due to a good selection of securities. In fact, security selection generated 39% of the fund's performance. Adding the interaction effect, the overall effect (S') is 3.57% which represents 45% of the overall performance.

The scatterplot in *Fig. 3* was created between the performance series generated by the tactical allocation and the fund's performance. We can clearly see that the tactical (A) allocation does not explain the variability of the fund's performance. (R-squared ≈ 0).

Fig. 4 below shows the regression between the fund's performance and that of the selection (S'). We note that the R-square is 58.5%, which is higher than R-squared obtained in *Fig. 2*. The variability of the performances of our fund is explained by the selection of securities.

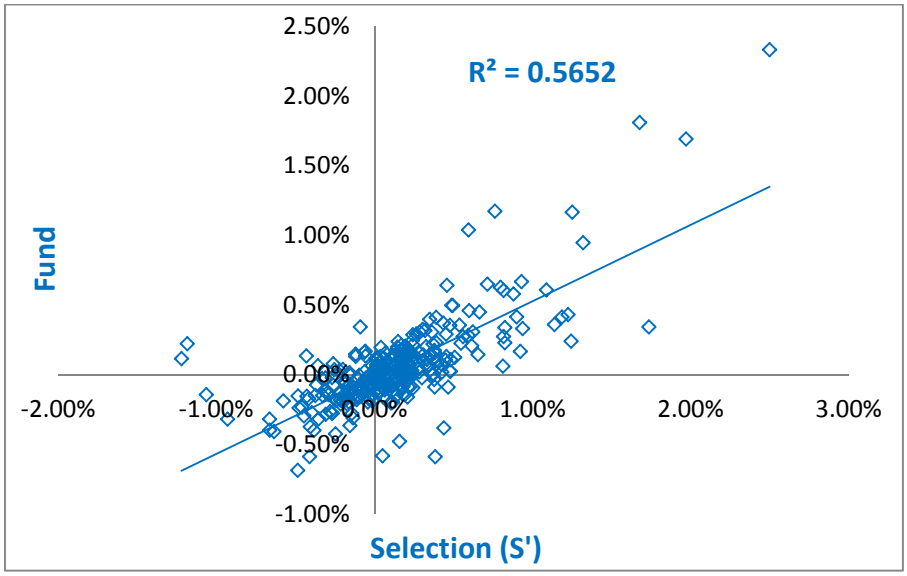

Fig. 4. **Scatter plot of fund performances (F29) versus selection performance**

Source: compiled by the authors.

We note the importance of strategic allocation in explaining the variability of fund performance. However, an investment process should not be limited only to this step. The active management techniques can potentially create additional value. This conclusion is reinforced by the value creation of our dynamic fund which created almost as much performance as the strategic allocation. The performance gap (+308 basis points on average per year) is very significant and requires the implementation of an adequate risk hedging policy. Finally, we note that our findings were observed over the 5-year period without being observed for each year of the study period. This confirms two principles: the first is that pension funds should balance a long-term strategy focused on financing their liabilities with active management. The second is that active management could be a source of value creation if the risk is well covered and the managers have the necessary skills to do so.

CONCLUSION

Strategic asset allocation for pension funds is an important step in the investment process. Given its strategic implications, it must be validated under the responsibility of the board direction. It must also be regularly monitored in order to successfully manage the objectives considering regulatory constraints and market developments.

The results of our study confirm the importance of strategic asset allocation in explaining the variability of Moroccan mutual funds. The level of variability obtained differs according to the three parameters that we have analyzed. However, other parameters such as the evolution of the economic and financial environment, the size and liquidity of markets could be the subject of further research.

Static allocation does not always suit to market fluctuations; fund managers take bets to create more performance. Active management makes it possible to take advantage of short-term market movements and security characteristics in investment decisions. But, moving away from strategic weightings generates a risk that should not be ignored. Managers must consider this when developing their investment strategy.

The studied pension fund recorded an average annual performance above its benchmark and that is due to a securities selection effect based on price expectations. The analysis of the performance gap was possible thanks to the performance attribution method. However, this analysis must be complemented by risk attribution to quantify the relative contribution of each asset to the overall risk.

Finally, the strategic allocation should not be static in order to take advantage of short-term market fluctuations; it is recommended to be dynamic based on an objective and rigorous mathematical approach.

APPENDIX

Table 1

Performance and risk indicators for the studied funds, %

Category	Fund	Average annualized perfromance		Gap ($r^P - r^B$)	Standard deviation		TE	R-square	$Contrib_{AM}$
		Fund r^P	Benchmark r^B		Fund	Benchmark			
Stock	F1	7.7	6.7	1.0	10.9	10.3	2.00	96.9	13.2
	F2	2.4	3.5	–1.0	17.4	18.9	2.20	95.3	–43.2
	F3	8.5	6.7	1.8	10.4	10.3	2.70	93.5	20.8
	F4	5.1	7.3	–2.2	8.6	11.3	3.30	95.7	–43.2
	F5	9.0	7.4	1.6	11.0	11.3	2.70	91.2	17.8
Bond	F6	4.4	3.4	1.0	1.3	0.9	0.70	73.7	22.0
	F7	4.8	3.5	1.2	1.0	1.0	1.00	62.4	26.1
	F8	4.0	3.4	0.6	1.9	0.9	1.50	32.0	14.6
	F9	3.9	3.8	0.1	1.1	0.80	0.80	61.6	3.3
	F10	6.0	6.3	–0.3	2.2	2.6	0.80	90.2	–4.9
	F11	6.3	6.8	–0.5	1.9	2.2	1.20	70.6	–7.1
	F12	6.6	6.3	0.3	2.4	2.6	0.90	87.9	4.8
	F13	6.0	6.3	–0.3	2.4	2.6	1.10	80.7	–4.8
	F14	2.4	3.8	–1.4	0.1	0.8	0.70	47.2	–58.6
	F15	5.7	5.3	0.4	2.2	1.9	0.60	93.7	6.3
	F16	5.9	5.3	0.6	2.1	1.9	0.40	96.5	9.6
	F17	6.1	5.3	0.7	2.1	1.9	0.60	93.3	12.0
	F18	6.0	5.3	0.6	2.2	1.9	0.60	93.7	10.7
	F19	5.9	5.3	0.6	2.1	1.9	0.40	97.0	9.8
	F20	6.0	5.3	0.6	2.1	1.9	0.60	92.5	10.7
	F21	5.9	5.3	0.6	2.2	1.9	0.90	84.3	9.6
	F22	5.2	5.3	–0.2	1.9	1.9	0.80	85.1	–3.1
	F23	5.7	5.3	0.4	2.2	1.9	0.50	95.9	7.1
	F24	3.7	2.3	1.4	1.0	1.2	0.40	86.2	36.9
	F25	3.5	2.3	1.2	1.3	1.2	0.50	82.5	33.8
	F26	3.3	2.3	0.9	1.2	1.2	0.40	88.8	28.0
	F27	3.7	2.4	1.3	1.2	1.3	0.40	91.2	34.8
Balanced	F28	6.1	5.4	0.6	2.4	2.2	0.90	86.4	10.4
	F29	9.0	4.7	4.4	6.7	2.7	6.90	27.4	48.5

Source: authors' calculations.

Table 2

Comparative results of the average R-square

Authors	Nature of the Funds	Country	R-square average, %
Brinson et al (1986)	Pension funds	United States	93.60
Brinson et al (1991)	Pension funds	United States	91.50
Ibboston and Kaplan (2000)	Pension funds	United States	88.00
	Mutual Funds		81.40
Drobetz and Köhler (2002)	Mutual Funds	Switzerland and Germany	82.90
Andreu et al (2010)	Funds invested in euro zone equities	Spain	92.99
	Funds invested in global equities		96.22

Source: [4–6, 9, 10].

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C. Elmsiyah — elaboration of the conceptual framework, formulation and justification of the hypotheses and analysis of the coherence between the theoretical framework and the practical framework.
O. Nouisser — validation of the methodology, the hypotheses and the final conclusion.

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