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Moroccan insurance and pension funds: realities of an investment policy

Organismes d'assurance et de retraite marocains : réalités d'une politique d'investissement

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Abstract: *How to invest the financial reserves of pension and insurance companies? And how to preserve their values over time? This debate is of great importance in the current financial context, especially when we know that the Moroccan pension funds and insurance companies have to adapt themselves to a bond compartment, characterized by a large decline in interest rates, a narrow stock market that has been in a bearish trend for several years, as well as an ever-present depletion risk of reserves (especially for the Caisse Marocaine des Retraites).The objective of this work is therefore to go through the various practices, used by Moroccan pension funds and insurance companies in asset allocation, as well as the different problems they encounter during this phase.*

Key Words: Asset allocation, investment horizon, institutional investors, insurance, pension funds.

Résumé : *Comment investir les réserves financières des organismes de retraite et d'assurance ? Et comment préserver leur valeur dans le temps ? Il s'agit-là d'une problématique qui a toute sa place dans le contexte financier actuel. En effet, le marché financier marocain est entré dans une grande phase de baisse des taux d'intérêt, accentuée par un certain ralentissement des performances boursières, ainsi qu'un risque omniprésent d'épuisement des réserves (tout particulièrement pour la Caisse Marocaine des Retraites). L'objectif de ce travail est donc de passer en revue les différentes pratiques utilisées par les organismes de retraite et d'assurance marocains en allocation d'actifs, ainsi que les différents problèmes qu'ils rencontrent durant cette phase.*

Mots clés : allocation d'actifs, horizon d'investissement, investisseurs institutionnels, organismes d'assurance, fonds de pension.

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1. INTRODUCTION

How to perpetuate a pension system? Or quite simply how to avoid the exhaustion of financial reserves? For several years, Morocco has been engaged in a major reform project, targeting different and varied aspects of its social security system. Nevertheless, although resulting from good will, these measures have been severely criticized by the general public, with the sole argument that these reforms impact directly the purchasing power of the citizen.

The objective of this paper is to discuss another aspect of reforms, namely the asset allocation policies of Moroccan institutional investors[1]. The goal is therefore to analyse this phase, highlighting the various problems and challenges that can emerge. With as much exhaustiveness as possible, we aim to broaden our field of vision and target the majority of Moroccan pension and insurance companies.

2. Asset allocation: a brief overview

2.1 Modern portfolio theory

Modern portfolio theory was created by Harry Markovitz in 1952 in his founding article "Portfolio Selection". This work has been at the origin of several developments in the world of finance (CAPM model, Sharpe and Tint model, Leibowitz model, etc.). The central idea of this theory is that the contribution of an asset to a portfolio must be computed in terms of its covariance with other assets (not in terms of its risk). According to the same author, the average risk of assets in the portfolio is generally higher than the average risk of the total portfolio (Amenc& Le Sourd, 2003: 110). So, an investor must diversify its market positions.

In 1958, James Tobin tried to integrate into Markovitz's work a new style of assets called risk-free assets. According to the same author, the construction of an investment portfolio can be decomposed into two steps: a first step where the manager identifies the optimal portfolio with the best risk/return ratio, and then a second step where the manager chooses between the optimal portfolio and a risk-free asset based on his risk aversion.

Subsequently, other theories tried to complete the modern portfolio theory. One of the best known is certainly the Capital Asset Pricing Model (CAPM). It was developed by several authors. The precursor was Treynor (1961), then Sharpe (1963), then Mossin (1966) and a little later Lintner (1965,1969) and Black (1972). The main idea of this theory is that the Markovitz model involved very voluminous calculations, especially the correlation matrix. This becomes even more complicated when we know that the calculation tools of the time were not very sophisticated. Therefore, Sharpe started to think about other alternatives. According to Sharpe, it is possible to assess an asset profitability based on its sensitivity to market ant also the profitability of the latter one. This is a real step forward in the world of finance, which will considerably reduce computing time.

Unfortunately, the very restrictive assumptions of the CAPM posed many problems. This is particularly the case for the market efficiency hypothesis, which is unrealistic, and above all very difficult to verify. These shortcomings have led to new developments that tried to overcome the restrictive assumptions of the CAPM, namely: The Zero-Beta Black's model (1972), The Brennan's CAPM with taxes (1970), Merton's version of the CAPM in continuous time (1973), etc.

2.2 Asset Allocation in Modern World

Modern finance is clearly about diversity. Indeed, the range of investments are no longer limited to the horizon of equities and bonds, with the emergence of traditional alternative investments such as real estate, commodities, private equity, as well as modern alternative investments such as hedge funds and managed futures.

These new vehicles gave managers the opportunity to invest in other areas that were previously inaccessible because they were considered illiquid and opaque. As a result, this new exposure offers clearly better diversification and a better risk management approach. On the other hand, the development of the Internet, the sophistication of the analysis techniques as well as data management tools have enabled managers to use and mathematicians to create increasingly relevant risk management and asset allocation tools.

3. Methodology and data

3.1 Sample and questionnaire

To our knowledge, the study we conducted here is the first of its kind in the Moroccan context. It stems

[1]Institutional investors is a very broad concept that includes: financial institutions, namely: banking institutions, asset management companies and insurance companies, private holding companies, deposit funds, pension funds, etc. However, in this paper we may sometimes use the word institutional investor instead of insurance and pension fundsin order to avoid repetition. Indeed, it is not at all a question of targeting the majority of Moroccan institutional investors, but only pension and insurance companies.

from a clear need for research and development in the field of social security. The founding idea of this work is to study in meticulously the asset allocation policy of the Moroccan pension funds and insurance companies. Unfortunately, this phase has been generally neglected by the authorities in the series of reforms they have undertaken since1990. For this reason, we decided to carry out an exhaustive field survey, through research questionnaire.

To construct our analysis tool, we initially based ourselves on three main questionnaires that already exist in the literature, namely: "Asset and Liability Modelling Questionnaire", "Private Equity Questionnaire" and "Asset Class Investing Risk Assessment Questionnaire". Indeed, we tried to take the framework of these three models to build our own questionnaire, which will adapt to the specificities of Moroccan pension funds and insurance companies. Subsequently, as a test phase, we sent a first copy of our questionnaire tithe AMIC. (Association Marocaine des Investisseurs en Capital), as well as one of the biggest Moroccan pension funds (which did not allow us to disclose its identity).

After we rectified some points in the questionnaire, we decided to begin the distribution process. For this purpose, we used the database that the AMIC prepared for us.[2] Subsequently, we proceeded in two ways: either by distributing the questionnaire electronically or manually, or by organizing direct meetings with the managers. Among the 11 questionnaires (a response rate of 73%) that we obtained, only one of them was not operational[3]. This leaves us with 10 out of 15questionnaires to include in the analysis. Among the 10 respondents to our questionnaire, we find three pension funds: CMR, CIMR and CNRA/RCAR, five insurance companies: MAMDA/MCMA, Saham insurance, Wafa insurance, Marocaine & vie, BMCI insurance and AXA insurance, and a reinsurance company: SCR. However, to ensure confidentiality, we hide the names of some investors in the analysis phase, because they prefer to not identify themselves to protect their market position. Therefore, we decided to replace their name with codes.

3.2 Statistical method

To treat our study, we use a non-linear principal component analysis (NLPCA). This method has been developed by several authors, including Gutmann (1941), Kruskal (1965), Shepard (1966), Kruskal and Shepard (1974). The objective is to explore the structures of relationships that may exist between different variables[4] with different levels of measurement (nominal qualitative, ordinal qualitative or quantitative variables).

The use of the NLPCA was not the fruit of the hazard. Indeed, it is based on certain considerations that we made in order to carry out our work. For example, we need a method that adapts to qualitative data, which is also able to distinguish between the modalities of a qualitative ordinal variable and the modalities of a qualitative nominal variable. For all these considerations, we could not, for example, use a traditional principal component analysis (PCA), since it is adapted to quantitative data, or a multiple correspondence analysis (MCA), which is certainly adapted to qualitative data, but unable to distinguish the order of modalities from variables, or even a correspondence factor analysis (CFA) that studies qualitative interactions between two variables, etc. For all these reasons, we decided to use a NLPCA. This is a complementary method to the PCA, which is particularly suitable for data sets containing variables with different measurement levels (nominal, ordinal or quantitative). Unfortunately, these cannot be studied linearly.

As with all other factorial analysis methods, the goal of the NLPCA is to describe a set of complex variables (ordinal, nominal or quantitative) and correlated with each other, with the minimum of uncorrelated dimensions. The latter describe the maximum amount of information contained in the set of variables, taking into consideration relationship structures that can be linear or non-linear. Technically, this procedure is realized by reducing the number of dimensions, and by transforming the nominal and/or ordinal variables into numerical values. The method used for this transformation process is called Optimal Scaling[5].

In reality, a non-linear PCA is practically identical to a classical PCA, with the only exception that the non-linear PCA first transforms the qualitative variables (ordinal or nominal) into numerical values, and then applies a classical PCA on the transformed

[2]This database contains the list of Moroccan insurance companies and pension funds that invest in the financial market, in addition to the telephone numbers and the managers' emailsof every organization.

[3]We sent the first questionnaire to Moroccan pension funds and insurance companies the 19/02/2019, and we closed this phase the 30/05/2019 after receiving eleven responses.

[4]For a detailed presentation of the variables, please refer to Appendix 1.

[5]The word optimal refers to the fact that the dimensions used in the model explain the maximum variance of the transformed variables; see; Linting & all (2007a), Meulman& all (2004) and Gifi (1990)for a detailed mathematical presentation.

data. Therefore, the entire mathematical procedure of PCA is performed in a non-linear PCA. For Linting & al (2007), in an NLPCA, the optimal scaling is achieved through an iterative algorithm that allows to converge to a point where all modalities do not move anymore. Moreover, if the NLPCA is applied on numerical data, this iterative algorithm of the NLPCA will converge exactly to the same solutions as a classical PCA.

Practically speaking, to apply the NLPCA, we used the CAPTCA module "Categorical Principal Components Analysis"; see Meulman&Heiser (2004). It is an analysis interface provided by the SPSS software that can be easily applied to a data base with different levels of measurement (ordinal, nominal or quantitative).

Finally, after defining the asset allocation strategy and modern portfolio theory, and after presenting the analysis methodology, we will then present the main results of our work. To do this, we will start by analyzing the investment policy of Moroccan institutional investors. After that, we will try to assess the institutional investors' level of knowledge about the alternative asset universe.

4. Moroccan Institutional Investors, a Detailed Investment Policy

4.1 Results Reading

Before starting our study, we must choose the number of dimensions that will describe the data set. To do this, we will refer to the graph of the total variances represented by dimensions. The idea is to use the elbow rule, which signals structural changes (Cattell, 1960). In our case, the elbow is at the level of the third dimension. This means a certain difference in variance between the second and third dimensions (the first two dimensions account for 47.473% of the total variance). Therefore, we decide to use a two-dimensional solution to describe the data set.

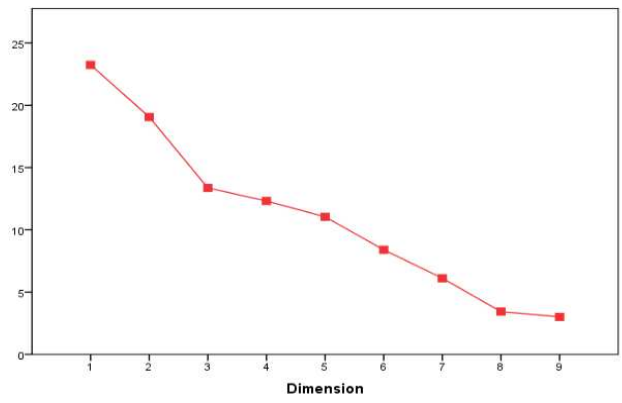

Chart -1: summary of variances represented by dimensions

We also chose the Spline Ordinal model[6] because it allows us to identify parsimonious and smoothed transformations; see Meulman&Heiser (2004) and Manisera& all (2016), in addition to concretizing the non-linear relationships that may exist between variables. As for Cronbach's alpha, it is in the order of 0.975[7]. Which is acceptable.

Table -1: Summary of the Spline Ordinal model

Dimension	Cronbach Alpha	Variance represented	
		Total (Eigenvalue)	% of variance
1	0.943	12.802	28.449
2	0.905	8.683	19.294
Total	*0.975*	*21.485*	*47.743*

It should also be noticed that there are variables in our database that show zero variances. These variables will certainly not contribute to the construction of the axes, but will directly answer some questions without going through the NLPCA. These variables are: justichan_prot_infla, portefclas_epuis_reserv and portefclas_pres_juridiq[8]. This means that all the pension and insurance companies in our data base will not take inflation into account when they change the composition of their investment portfolio in the future. This also means that they believe that in the future, they will be sufficiently protected against inflation with the current portfolio. For the same investors, the risk of depletion of financial reserves and legal pressures are not factoring to be taken into consideration. It is likely in this case that market conditions (narrow markets, lack of investment opportunities, wait-and-see attitude, mistrust, etc.) are the real causes that can push the pension/insurance companies in our data base to orientate its savings towards a single portfolio, focused on traditional assets.

For the purposes of the study, we preferred to reduce the number of variables and only keep those that are best explained by the two dimensions. To do this, we used the VAF (Variance Accounted For) principle. The idea is to select only those variables whose total variance explained by the two

[6] **Spline ordinal model:** The order of the modalities of the observed variable is kept in the optimally coded variable. The points of the modalities are on a straight line (vector) passing through the origin. The resulting transformation is a smooth monotonous polynomial model.

[7] Cronbach's alpha is generally considered satisfactory in theory when its value is greater than 0.8.

[8] All the institutional investors provided the same answers to these three questions, namely no.

dimensions is greater than, 25%; see Lintin& all (2007) and Linting & Van Der Kooji (2012)[9].

This leads us to eliminate the following variables: type_strat_allocat;justichan_max_rend;justichan_actif_passif; justifchan_changperc_march;model_determ; model_determ_sensib;courterm_intelec;courterm_opport;portefclas_avers_risqand finally portefclas_etroit_march (for more precision,see appendix 2).

4.2 Results Interpretation and Discussion

To start the analysis, it is first necessary to interpret the diagram of correlations between dimensions.

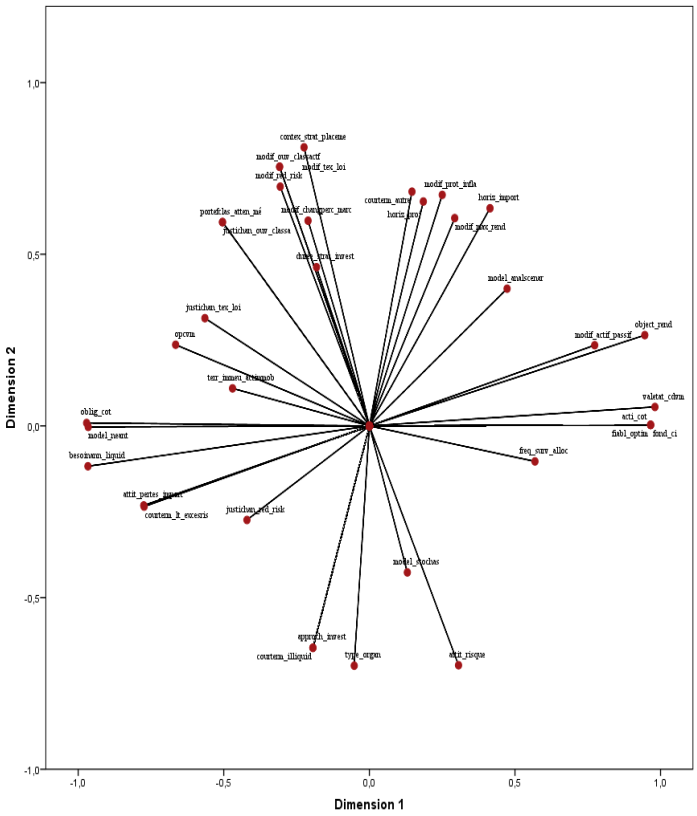

Chart -2: Correlation between dimensions

In the beginning we can see that the vectors length of some variables is quite short[10]. Which means that these variables do not fit correctly in a two-dimensional solution. It would therefore be preferable not to interpret them. However, they will probably be better integrated into a solution involving more dimensions. These variables are: terr_immeu_actimmob; duration_strat_invest; justichan_red_risk; model_analscenar and model_stochas.

It should also be noticed that there is no common factor between all variables, since not all variables are positively or negatively correlated with any dimension.

We can also see that the first-dimension contrasts two types of variables. A first type which groups the positively correlated variables with the first dimension, namely: fiabl_optim; oblig_cot; acti_cot; fond_ci; valetat_cdvm; object_rend; freq_surv_alloc and modif_actif_passif. On the other hand, we find another type that groups the negatively correlated variables with the second dimension, namely: OPCVM; justichan_ouv_classactf; justichan_tex_loi; model_neant; courterm_lt_excesrisq; besoinann_liquid; attit_pertes_import and portefclas_atten_méfian.

in its turn, the second-dimension contrasts two types of variables: a first type which contains negatively correlated variables with this second dimension, namely: type_organ[11]; approach_invest; courterm_illiquid and attit_risque. On the other hand, we find the variables that are positively correlated with this same dimension, namely: modif_red_risk; modif_max_rend; modif_changperc_march; modif_ouv_classactf; modif_tex_loi; modif_prot_infla; justichan_ouv_classactf; courterm_autre; horiz_proj; horiz_import; contex_strat_placement[12]; portefclas_atten_méfian.

To ease the interpretation, we can also refer to the graph that plots each organism in the space of 2 dimensions according to its responses (for more precision, see appendix 3):

[9]Comrey (1973) proposed an alternative rule for selecting variables to use in the analysis. According to him, a VAF of a variable per component that is equal to 10% is insufficient, a VAF of 20% per component is correct, a VAF of 30% per component is good, a VAF of 40% per component is very good and a VAF of 50% per component is excellent.

[10]The length of the vector of a given variable corresponds to its adjustment.

[11]The vector of the type of organism variable points to its highest modality, which in our case is the insurance organism modality (this choice was made arbitrarily when the database was entered). By its nature, an insurance organism preferred shorter investment horizons compared to a pension organization. This naturally directs the vector of this variable towards investment behavior that has been described as a short-term.

[12]This will allow us to determine what type of portfolio the investor should build, between traditional (equity/bonds/money markets) and diversified portfolios.

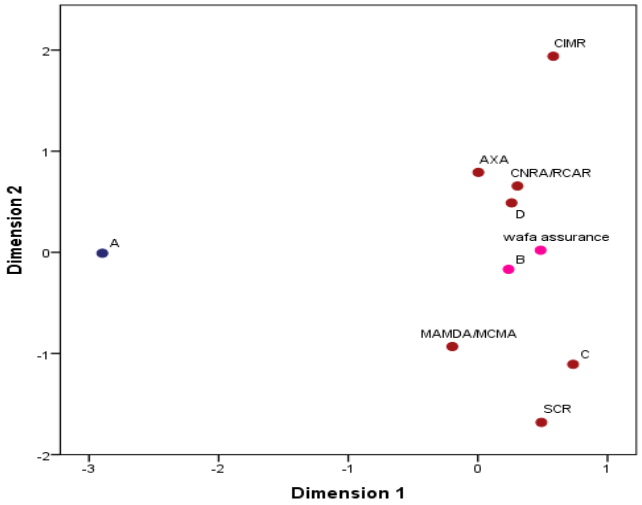

Chart -3: Organisms in the two-dimensional space

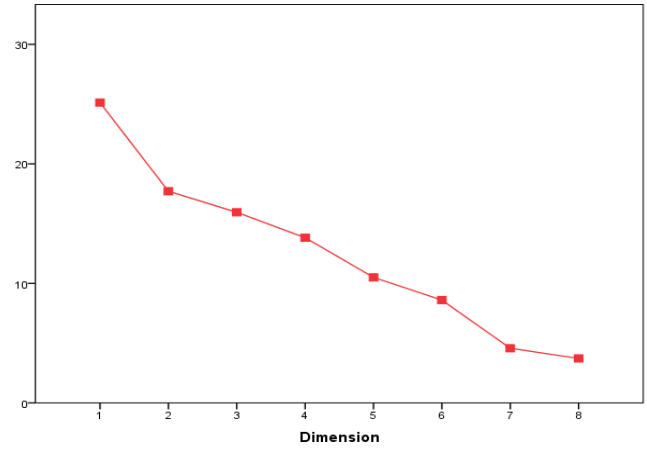

Chart -4: summary of variances represented by dimensions

The remark that attracts our attention in the first place is the location of the "organism A" in the space of both dimensions. Indeed, it is the organism that reacts the least and suffers the most from the market. It is very penalized by its liquidity needs, does not diversify sufficiently in the market and targets very modest returns. However, we can't say more than that, since "organism A" is very atypical[13] (with extreme coordinates) and tends to bias the analysis. It may be preferable to do the same work again by ejecting the "organism A" from our database.

5. Moroccan Institutional Investors, a Detailed Investment Policy: an extension of the study

5.1 Results Reading

The procedure is always the same: first select the number of dimensions to be included in the analysis. Thus, by using the elbow rule, we can identify two elbows: one that is in the second dimension and the other that is in the seventh dimension:

Thus, according to the rule of (Cattell, 1960), we should keep only the first dimension, because the difference in variance when moving from the first to the second dimension is much bigger (there is a very clear structural change). However, since the first-dimension accounts for only 28.512% of the total variance, and the second-dimension alone accounts for 19.259% of the total variance (which is not at all negligible), it may also be appropriate to include this second dimension in the analysis. We are also entitled to wonder about the relevance of this choice, which deviates in a way from the theory (Cattell's rule), and is more a matter of intuition. However, when we compare this result (47.771% of the total variance divided between 28.512% for the first dimension and 19.259% for the second dimension) with the average of the total variances of 10,000 PCA constructed from combinations of totally independent variables for the same conditions: i.e. 2 dimensions, about 50 variables and 9 individuals. We can reassure ourselves on the relevance of the choice, insofar as our two-dimensional model is in any case better than random (47.771% for our model against 41% for the independent variable PCA) (for more precision, see appendix 4).

At this level, we also decided to use the Spline Ordinal model, because it is smoother and more parsimonious, while being able to recognize the non-linear relationships that can exist between variables. Cronbach's Alpha is 0.974. Which is perfectly acceptable.

[13] The atypical results we have obtained for organism A can be interpreted in our view in two ways: either because this organism is in a bad situation and has financial problems, or perhaps because this organism did not analyze this part of the questionnaire with care. This makes the interpretation rather risky.

Table -2: Summary of the Spline Ordinal model

Dimension	Cronbach Alpha	Variance represented	
		Total (Eigenvalue)	% of variance
1	0,94	12,26	28.512
2	0,9	8.281	19.259
Total	0,974	20.541	47.771

We also considered eliminating variables whose total variance explained by the two dimensions is less than 25%. This leads us to eliminate the following variables: type_strat_allocat ;terr_immeu_actimmob ; justichan_actif_passif; model_determ; courterm_intelec; courterm_opport; portefclas_avers_risq; portefclas_etroit_march. (For more precision, see appendix 5).

5.2 Results Interpretation and Discussion

As usual, we should start by reading the graph of correlations between dimensions. The latter is as follows:

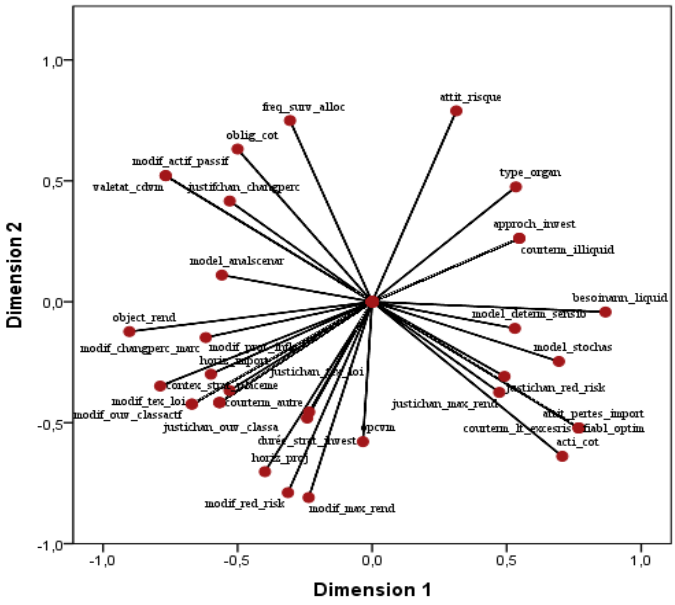

Chart -5: Correlation between dimensions

We can see from this graph that the vector lengths of some variables are quite short. They will unfortunately bias the analysis, as they do not fit correctly in a two-dimensional system. It would therefore be preferable not to interpret them. These variables are: duration_strat_invest; justichan_red_risk; justichan_max_rend and justichan_tex_loi.

The first dimension also opposed two behaviours: the first with which it is positively correlated and which contains the following variables: type_organ; approach_invest; fiabl_optim; acti_cot; model_determ_sensib; model_stochas; courterm_lt_excesrisq; courterm_illiquid; besoinann_liquid and attit_pertes_import. As well as a second behavior with which it is negatively correlated and which is constituted from the following variables: valetat_cdvm;oblig_cot; modif_actif_passif;modif_changperc_march;modif_ouv_classactf;modif_ouv_classactf;modif_tex_loi;modif_prot_infla;justifchan_changperc_march;justichan_ouv_classactf; model_analscenar; courterm_autre; horiz_import; object_rend; contex_strat_placement and portefclas_atten_méfian.

Thus, the positive side of the first dimension[14] characterizes organisms[15] that invest on average a fairly large quantity of their financial reserves in listed equities, which have fairly big liquidity needs, for which the short term ensures the minimization of liquidity risk and especially excessive risk-taking, and at last when faced with significant losses, profoundly change the composition of their portfolio (much more than organizations that are on the negative side of the same dimension). The negative side of this dimension[16] characterizes organisms that modify and will modify in the future the constitution of their investment portfolio for several reasons: to ensure the matching of assets with liabilities, to open up to new asset classes, to adapt to changes in legal texts, etc. On average, these same organisms target relatively high return objectives, give more importance to significant investment horizons and try to diversify their investments more than other organisms in our data base (between traditional and alternative assets), etc.

In summary, we can say that the positive side of the first dimension draws a **short-term investment behavior**, while the negative side of the same dimension draws a **long-term investment behavior**. It should also be noticed that talking about long-term investment behavior and short-term investment behavior can be confusing. For us, these are two concepts that go beyond the time aspect of

[14]The institutional investors that will be on this side of the first dimension will use deterministic modeling,and will complete it witha stochastic modeling to better understand the time aspect; see Faleh (2011).

[15]Some variables adjust correctly to the first and second dimension. As a consequence, we have decided to interpret them in terms of the dimension with which they best fit.

[16]The institutional investors on this side of the first dimension will use scenario analysis models. It is a tool that enables the user to generate several scenarios with different trajectories, and to make projections over time to study the organization's liabilities and assets (Faleh, 2011).

investment. For example, a long-term investment behavior, in addition to being an investment that is fairly spread over time, describes diversified investments aimed at significant performance, etc.

The point we can also make at this level is that there is a logical effect of portfolio diversification and liquidity needs on performance objectives. Indeed, the organisms that aspire to generate high returns are those that decentralize their investments (between alternative and traditional assets), and that control their liquidity needs. Afterwards, it is not necessarily a discovery that is out of the ordinary, but which has its magnitude, especially when we know that Moroccan institutional have some difficulties to nest profitable investments.

In turn, the second dimension separated on one side and on the other the variables that show a positive correlation and the variables that show a negative correlation with the same dimension. The positive side concentrates the following variables: attit_risk;modif_active_passive;valetat_cdvm;oblig_cot and freq_surv_alloc, and the negative side concentrates the following variables:courterm_lt_excesrisq;horiz_proj;attit_pertes_import; fiabl_optim[17]; acti_cot; opcvm; modif_red_risk and modif_max_rend. All this means that the organisms that will be on the positive side of the second dimension are on average less risk-averse, and invest larger amounts in government securities, CDVM guaranteed security and listed bonds. These same organisms tend to monitor their investment portfolios at lower frequencies (on average annually versus quarterly for other organisms). For organisms that will be on the negative side of the second dimension, they invest on average larger amounts in listed shares and UCITS, they make projections over longer periods (ranging from 5 to 20 years and more against periods of less than 5 years for other organisms), they profoundly change the structure of their portfolio when they incur significant losses, such as focusing their financial reserves in the short term. Lastly, they consider maximizing return and minimizing risk as objectives they want to reach when changing the composition of their investment portfolio, etc.

It should also be noticed that there is a small logical contradiction to report which can be disturbing in understanding the results of the second dimension. Indeed, the institutions in our database that invest the most in bonds and the least in listed shares (compared to other institutions) are those that consider themselves the least risk-averse. This may seem irrational, since a bond is less risky in nature than listed share. Nevertheless, to assess an investor's risk aversion, it is necessary to refer to the investment portfolio as a whole, between listed/unquoted shares, government bonds/non-state bonds, real estate, etc. This contradiction may also be the result of a misjudgement. In this case and at the level of the questionnaire, we asked the pension/insurance compagny to assess its level of risk aversion/propension in order to assess its risk exposure[18]. So, it is a judgment that is subjective in nature, that does not rely on statistics and that is not necessarily based on the same criteria. This may also explain this contradiction. At the end, we believe that the negative side of the second dimension describes a **cautious and prudent investment behavior**, compared to **a more confident investment behavior** for the positive side of the same dimension. We can further elucidate our results by reading the graph that plot each organism according to its responses in the space of 2 dimensions (for more precision, see appendix 6):

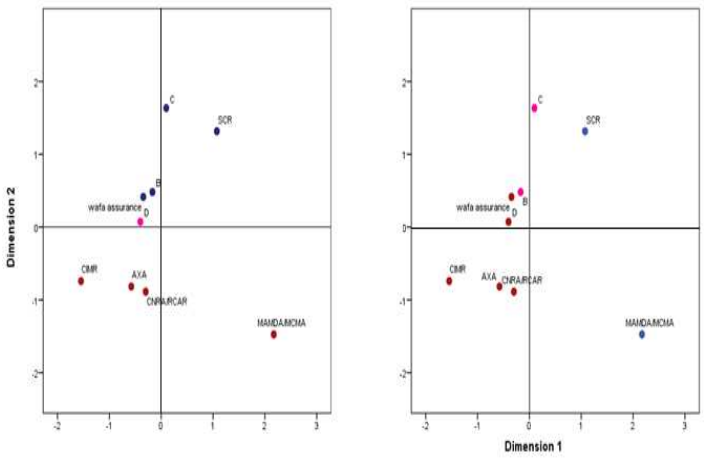

Chart -6: Organisms in the two-dimensional space

Thus, we notice that the first dimension[19]separated in the first group: "MAMDA/MCMA and SCR" and in the second group: "Wafa insurance, organism D, CNRA/RCAR, AXA and CIMR". Consequently, the first group concentrates pension/insurance compagnies who are

[17]For the variable "fiabl_optim" whose hierarchical order of modalities is as follows: "not reliable, reliable, not useful, useful and neutral with respect to this technique", the overwhelming majority of our database considers it a useful tool, with the exception of MAMDA/MCMA which is neutral about this technique (this variable is better described by the first dimension). "Organism A", in turn, which is not part of this database, considers optimization as an unreliable tool.

[18]In our opinion, the only way that we had to assess the level of institutional risk exposure (this is confidential data) was to ask the question as we had done. That is, in the form of a Likert scale, with the following modalities: high risk aversion, risk aversion, light aversion/light propensities, risk propensities and high-risk propensities.

[19]At this level, we cannot interpret "organism C and organism B", because they do not adjust correctly to this first dimension.

characterized by a rather short-term investment behavior against a more long-term investment behavior for the second group. It should also be noticed that the first group is penalized by its liquidity needs (15% to 35% annually of the investment portfolio), which influence its choices, thus pushing it to develop a short-term investment position. The second dimension[20], on the other hand, gave rise to two groups. The first one is made up of the following organisms: "SCR, organism C, organism B and Wafa insurance", against a second group made up of the following organisms: "MAMDA/MCMA, CNRA/RCAR, AXA and CIMR". We can therefore say that the first group corresponds to investors with more confident investment behavior (less risk-averse), compared to a second group made up of organisms with more circumspect and prudent investment behavior.

In the following pages of this work, we will try to highlight the pension/insurance companies knowledge of the alternative asset's universe. The objective is to see whether the non-traditional asset[21] can really play its role as a real alternative asset to stock and bond markets, especially in the current context.

6. What level of knowledge of alternative assets for Moroccan institutional investors?

6.1 Results Reading

Let's start by reading the graph of the total variances using the Cattell rule. To do this, we can distinguish two elbows: a first one that is at the level of the second dimension and a second one that is at the level of the third dimension (much less accentuated). In this case, we have two possibilities: either settle for a single dimension, which describes only 25.705% of the total variance, or aim for exhaustiveness, and try to extract as much information as possible by selecting two dimensions. In this case, we decided to use the second choice.

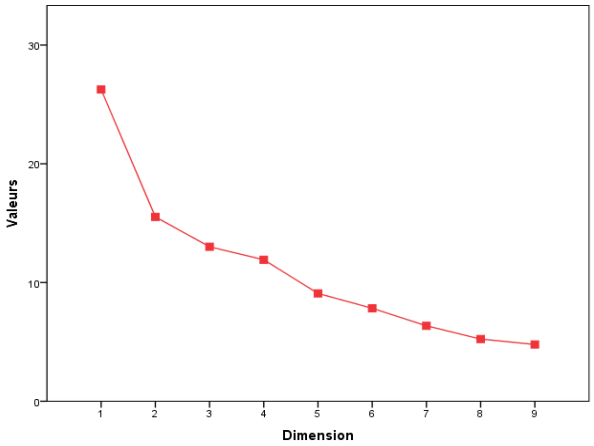

Chart -7: summary of variances represented by dimensions

As usual, we chose the Spline Ordinal for all the reasons we mentioned above (parsimony and level of smoothing). Cronbach's alpha of 0.98 is also very satisfactory.

Table -3: Summary of the Spline Ordinal model

Dimension	Cronbach Alpha	Variance represented	
		Total (Eigenvalue)	%of variance
1	0,957	17.183	27.714
2	0,925	11.091	17.888
Total	0,98	28.273	45.602

For the purposes of the study, we will also eliminate variables whose total variance explained by the two dimensions is less than 25%.

These variables are: intervimmob_march; intervinfra_march;segmt_immob_res;segmt_immob_autre ; ci_exers_influenc ; ci_maxrend_rendabsolu ; ci_cashflo_stabl ;immob_adoss_actifpassif ;immob_exers_influenc ; infra_benef_fiscal ; ci_info_boursautre ; immob_info_boursautre. (For more precision, seeappendix 7).

6.2 Results Interpretation and Discussion

First, let's read and interpret the diagram of correlations between dimensions. The latter is as follows:

[20] At this level, we cannot interpret "organism D", because it does not adjust correctly to this second dimension.

[21] alternative or non-traditional assets means private equity, real estate and infrastructure

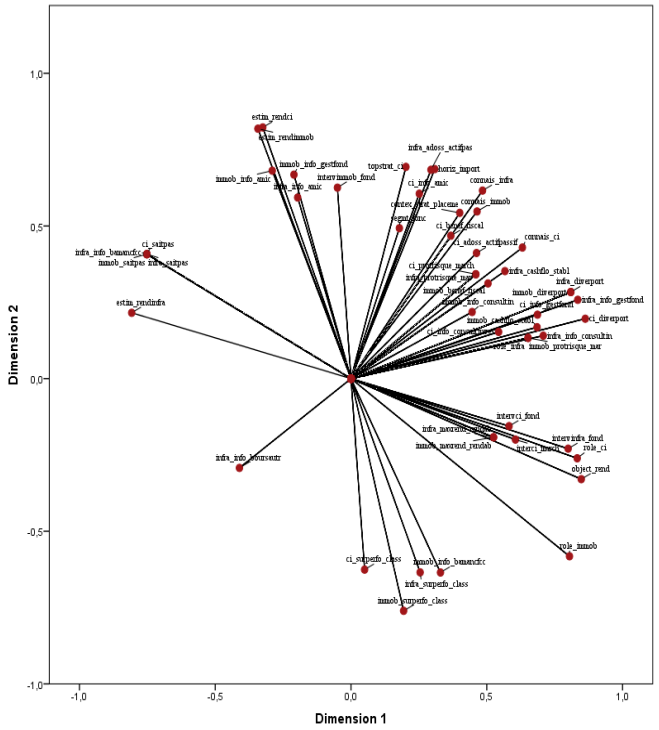

Chart -8: Correlation between dimensions

Let us not forget that the lengths of the vectors of some variables are quite small. To avoid hazardous conclusions, we have decided not to interpret them. These variables are : segmt_fonc ; ci_adoss_actifpassif ;ci_protrisque_march ;ci_benef_fiscal ;infra_protrisque_march ;immob_info_consultinvest ; infra_info_boursautre. However, they will contribute to the construction of the two factorial axes.

First, we can see that there are no common factors among all the variables, since they are not all positively or negatively correlated with any dimension. We can also observe a redundancy in some variables, which adjust correctly with respect to the first and second dimensions. We therefore decided to interpret them only once (with the first dimension)[22]. These variables are : connais_ci;connais_immob; connais_infra; ci_saitpas; immob_saitpas; infra_saitpas and role_immob.

The first dimension opposes two groups of variables: a first one thatcontains the negativelycorrelated variables with the first dimension, namely: ci_saitpas; immob_saitpas; infra_saitpas; infra_info_bamancfcc and estim_rendinfra, as well as a second group thatincludes the positivelycorrelated variables with the same dimension, namely: object_rend; role_ci; role_immob; role_infra; role_infra; connais_ci; connais_immob; connais_infra; interci_march; intervci_fond; intervinfra_fond; ci_diverport; immob_diverport; immob_maxrend_rend_rend_rendabsolu; immob_protrisque_march; immob_benef_fiscal; immob_cashflo_stabl; infra_diverport; infra_maxrend_rend_rendabsolu; infra_cashflo_stabl; ci_info_consultinvest; ci_info_gestfond; infra_info_consultinvest and infra_info_gestfond. Clearly, this first dimension confronts two behaviors. The first one which is constructed from variables that are negatively correlated with the first dimension, which we can describe as **non-connoisseurs**. This behavior describes organizations that do not have sufficient knowledge of the alternative asset universe (compared to the other institutional in our database) and/or have no idea of the contribution that can bring an alternative asset to the reserves management. These same institutional also tend to overestimate infrastructure return.

It should also be noticed that there is a real lack of knowledge about infrastructure. Indeed, some institutional investors believe that they do not know enough about this universe.

Table -4: level of institutional investors knowledge of alternative assets

Variable/modality		Number
connais_ci	No knowledge	0
	Reduced knowledge	0
	Moderate knowledge	0
	Good knowledge	6
	Perfect knowledge	4
connais_immob	No knowledge	0
	Reduced knowledge	0
	Moderate knowledge	0
	Good knowledge	7
	Perfect knowledge	3
connais_infra	No knowledge	0
	Reduced knowledge	1
	Moderate knowledge	3
	Good knowledge	3
	Perfect knowledge	3

In addition to that, we find that institutional investors that do not have sufficient control over infrastructure investments tend to overestimate its return. This mean probably that a poor knowledge of

[22]We decided to interpret these variables at the level of the first dimension, since it concentrates a larger amount of variance (compared to the second dimension).

infrastructure (not knowing enough about this universe and/or being unaware of the contribution it can bring to reserve management) can lead the institutional to overestimate it, and expose itself to considerable losses. This is not absurd, especially when we know that some Moroccan institutional investors have suffered in the past from bad experiences with infrastructure, partly because of this overestimation.

On the other hand, we find another type of behavior, constructed from variables that are positively correlated with the first dimension, which we can logically describe as **connoisseurs**. Indeed, the organisms that will be located on this side of the first dimension think that they know enough about the universe of alternative assets, assign them very important roles in the constitution of the investment portfolio (much more than the other organisms in our database) and are therefore aware of the contribution they can have in the management of financial reserves, between maximizing absolute return, protecting against certain market risks, diversifying the investment portfolio, etc. These same institutional investors obtain information on alternative assets from fund managers and/or investment consultants. Unlike institutional which will be on the negative side of the first dimension, which will obtain this information from the BAM/ANCFCC[23]. This may mean that the BAM/ANCFCC is not necessarily the right source of information to use (especially for infrastructure). It may be more appropriate to look to other sources of information, such as: fund managers and investment consultants.

The second dimension, on the other hand, confronts two behaviors. First grouping the following variables (negative correlation): ci_surperfo_class; immob_surperfo_class; infra_surperfo_class[24] and immob_info_bamancfcc, as well as a second behavior grouping the following variables (positive correlation): "horiz_import; contex_strat_placement; intervimmob_fond;topstrat_ci;infra_adoss_actifpassif; ci_info_amic;immob_info_gestfond; immob_info_amic; infra_info_amic; estim_rendimci and estim_rendimmob. We can therefore say that the second dimension opposes a first behavior that we can describe as: **over-performance generator**, to a second behavior that we can describe as: **diversified, long-term investments but skeptics about the over-performance of alternative assets**.

We can therefore say that the institutional investors who will be on the side of the first behavior think that alternative assets in its three categories outperform traditional assets on a risk-adjusted return basis. Unlike other institutional investors, who are estimating more optimized return for alternative assets in absolute terms, who are more focused on the long-term and more diversified, but are not convinced at all about this over-performance (risk adjusted to return). This generally means that: while the second group anticipates more attractive returns for alternative assets, the first group estimates more controlled risks.

We can also refer to the plot of the organisms in the two-dimensional space. The latter is as follows (for more precision, see appendix 8):

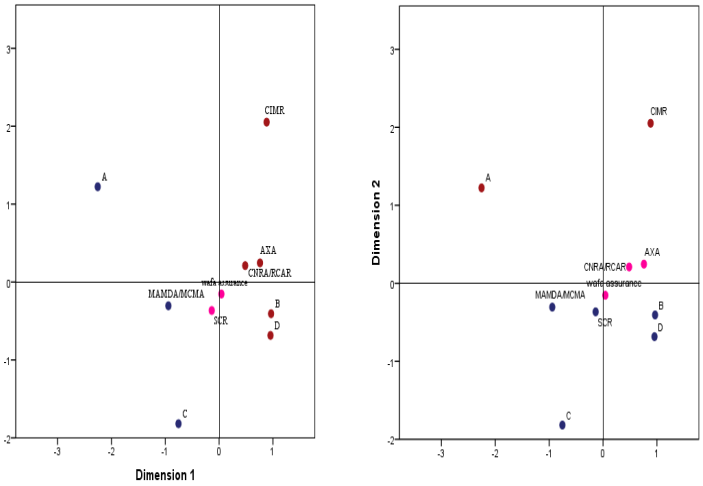

Chart -9: Organisms in the two-dimensional space

Thus, we noticed that the first dimension separated two groups on either side[25]. The first one on the positive side of the first dimension, which contains: CIMR, AXA, CNRA/RCAR, organism B and organism D. The second group contains: organism A, MAMDA/MCMA and organism C. Thus, we can say that the first group is that of connoisseurs (since located on the positive side of the first dimension), who think they have sufficient knowledge of the universe of alternative assets, between private equity, real estate and infrastructure. The second group of institutional investors is that of the non-connoisseurs (since they are on the negative side of the first dimension), who consider that they do not

[23]BAM/ANCFCC : Bank Al Maghrib/Agence Nationale de la Conservation Foncière, du Cadastre et de la Cartographie

[24]These three dichotomous variables will allow us to confirm, or refute, the idea that alternative assets outperform traditional assets, compared to risk-adjusted returns (Sharpe ratio, Treynor measure, etc.). This means that organizations that are going to be on the negative side of the first dimension think on average that: alternative assets outperform traditional assets in terms of risk-adjusted returns.

[25]We can also form a third group (pink brand), which contains: "SCR and Wafa insurance". However, this is the group of institution's that do not adjust correctly to the first dimension. Therefore, we cannot speak of a group in the true sense of the word, since it is not interpretable.

know enough about this universe and/or are not aware of the contribution that an alternative asset can bring to an investment portfolio.

For its turn, the second dimension isolated two types of organisms[26]. A first group located in the positive quadrant of the second dimension and containing: the CIMR and organism A, as well as a second group located in the negative quadrant of the same dimension, namely: the organism B, the organism C, the SCR, the MAMDA/MCMA and the organism C. In conclusion, we can say that the group located in the positive quadrant concentrates diversified and more long-term institutional investors, who do not believe that alternative assets can outperform traditional assets on a risk-adjusted return basis, although they are very optimistic about the performance of this vehicle. Unlike the institutional investors located in the negative quadrant, which are certainly less focused on long-term, less diversified, but which believe in this over-performance (risk-adjusted return basis).

7. CONCLUSIONS

This work was an opportunity for us to examine the practices used, the constraints and the objectives targeted by Moroccan pension funds and insurance companies when they invest their reserves on the Moroccan financial market. Thus, through a field survey and a NLPCA, we were able to list the pension funds and insurance companies in our database in separate groups. Each group is characterized by an investment behavior that differentiates it from the others. In this case, the first study[27] allowed us to oppose pension funds and insurance companies who are more focused on long-term horizons to pension funds and insurance companies who are more focused on short-term horizons, and secondly trustful pension funds and insurance companies to more cautious and circumspect pension funds and insurance companies.

For its turn, the second study[28] allowed us to confront, on the one hand, the institutional that are much more familiar with alternative assets, to institutional that are less familiar with this type of asset. On the other hand, institutional who doubt that alternative assets can outperform traditional assets on a risk-adjusted return basis, against institutional who are much more convinced about this over-performance.

However, this classification was made possible by identifying two dimensions for each part of the study. Each dimension summarizes a significant amount of the information contained in the database. For example, the two dimensions selected for the first study account for 47.771% of the total variance. In its turn, the two dimensions of the second study describe 45.602% of the total variance.

It should also be noticed that this study is a part of a broad research process that we have been undertaking for the past two years. This will be complemented by other work in the coming months which will focus mainly on alternative assets (private equity, real estate, commodities, etc). As clearly as possible, we would like to study this investment universe and to create enough distance to identify weak points and maybe improvement areas.

[26]Here too, we are able to form a third group, which includes "the Wafa insurance, the CNRA/RCAR and the AXA". However, this is the group that does not adjust well to the second dimension, making the interpretation risky and inappropriate.

[27]The first study is entitled "Moroccan institutional investors, a detailed investment policy".

[28]The second study is entitled "What level of knowledge of alternative assets for Moroccan institutional investors?".

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Appendix 1: data dictionary

Variable	Meaning of the variable	Variable type
nomorgan	organism's name	nominal
type_organ	type of the organism	nominal
type_strat_allocat	type of allocation strategy developed	nominal
approch_invest	the investment approach developed	nominal
fiabl_optim	the reliability of the optimization	nominal
valetat_cdvm	the weight of the portfolio allocated to investments in government securities or having received the CDVM's visa	ordinal
oblig_cot	the weight of the portfolio allocated to investment in listed bonds	ordinal
acti_cot	the weight of the portfolio allocated to investment in listed shares	ordinal
fond_ci	the weight of the portfolio allocated to investments in private equity funds	ordinal
terr_immeu_actimmob	the weight of the portfolio allocated to investments in land, buildings and fixed assets	ordinal
OPCVM	the weight of the portfolio allocated to investment in UCITS	ordinal
durée_strat_invest	the number of years that the investment strategy (portfolio composition) is in place	ordinal
freq_surv_alloc	the frequency of monitoring the allocation strategy	ordinal
modif_red_risk	risk reduction is a factor that the institution takes into consideration when changing the allocation of its portfolio	Dichotomous variable
modif_max_rend	maximizing return is a factor that the institution takes into consideration when changing the allocation of its portfolio	Dichotomous variable
modif_actif_passif	asset/liability matching is a factor that the institution takes into consideration when changing the allocation of its portfolio	Dichotomous variable
modif_changperc_march	change in market perception is a factor that the institution takes into consideration when changing the allocation of its portfolio	Dichotomous variable
modif_ouv_classactf	opening up to new asset classes is a factor that the institution takes into consideration when changing the allocation of its portfolio	Dichotomous variable

Variable	Meaning of the variable	Variable type
horiz_proj	the time horizon of the projections	ordinal
horiz_import	the preferred investment time horizon	ordinal
object_rend	the performance objective being pursued	ordinal
besoinann_liquid	annual liquidity requirements	ordinal
attit_risque	the level of risk aversion	ordinal
attit_pertes_import	attitude towards significant losses	ordinal
contex_strat_placement	investment strategy developed in the current context	nominal
portefclas_epuis_reserv	institutional approach is limited to the traditional portfolio to avoid the exhaustion of reserves	Dichotomous variable
portefclas_avers_risq	the institutional is limited to the traditional portfolio because of its risk aversion	Dichotomous variable
portefclas_etroit_march	the institutional sector is limited to the traditional portfolio since the alternative asset market is very narrow	Dichotomous variable
portefclas_atten_méfian	the institutional is limited to the traditional portfolio because of a wait-and-see attitude and mistrust	Dichotomous variable
portefclas_pres_juridiq	the institutional is limited to the traditional portfolio to avoid legal pressures	Dichotomous variable
connais_ci	the level of knowledge of private equity	ordinal
connais_immob	the level of knowledge of real estate	ordinal
connais_infra	the level of knowledge of the infrastructure	ordinal
role_ci	the importance of the role given by the institutional to private equity	ordinal
role_immob	the importance of the role given by the institutional to real estate	ordinal
role_infra	the importance of the role given by the institutional to infrastructure	ordinal

Variable	Meaning of the variable	Variable type
ci_cashflo_stabl	private equity generates stable cash flows	Dichotomous variable
ci_saitpas	the institutional has no idea of the contribution that private equity can bring to reserve management	Dichotomous variable
immob_diverport	real estate makes it possible to diversify an investment portfolio	Dichotomous variable
immob_adoss_actifpassif	real estate makes it possible to match assets with liabilities	Dichotomous variable
immob_exers_influenc	real estate makes it possible to influence the functioning of the targeted companies	Dichotomous variable
immob_maxrend_rendabsolu	real estate maximizes absolute return	Dichotomous variable
immob_surperfo_class	real estate makes it possible to outperform traditional assets on a risk-adjusted return basis	Dichotomous variable
immob_protrisque_march	real estate provides protection against certain market risks	Dichotomous variable
immob_benef_fiscal	real estate makes it possible to generate a taxable profit	Dichotomous variable
immob_cashflo_stabl	real estate generates stable cash flows	Dichotomous variable
immob_saitpas	the institutional has no idea of the contribution that real estate can bring to the management of reserves	Dichotomous variable
infra_diverport	infrastructure allows the diversification of an investment portfolio	Dichotomous variable
infra_adoss_actifpassif	infrastructure allows the asset to be matched with the liability	Dichotomous variable
infra_exers_influenc	infrastructure makes it possible to influence the functioning of the targeted companies	Dichotomous variable
infra_maxrend_rendabsolu	infrastructure maximizes absolute return	Dichotomous variable
infra_surperfo_class	infrastructure outperforms traditional assets on a risk-adjusted return basis	Dichotomous variable
infra_protrisque_march	infrastructure provides protection against certain market risks	Dichotomous variable
infra_benef_fiscal	the infrastructure generates a taxable profit	Dichotomous variable

modif_tex_loi	changes in legislative texts is a factor that the institution takes into consideration when changing the distribution of its portfolio	Dichotomous variable
modif_prot_infla	inflation protection is a factor that the institution takes into account when changing the allocation of its portfolio	Dichotomous variable
justichan_red_risk	risk reduction is a factor that would justify the allocation of the investment portfolio in the future	Dichotomous variable
justichan_max_rend	maximizing return is a factor that would justify the allocation of the investment portfolio in the future	Dichotomous variable
justichan_actif_passif	asset/liability matching is a factor that would justify the allocation of the investment portfolio in the future	Dichotomous variable
justifchan_changperc_march	change in market perception is a factor that would justify the allocation of the investment portfolio in the future	Dichotomous variable
justichan_ouv_classactf	opening up to new asset classes is a factor that would justify the allocation of the investment portfolio in the future	Dichotomous variable
justichan_tex_loi	changes in legislation is a factor that would justify the allocation of the investment portfolio in the future	Dichotomous variable
justichan_prot_infla	inflation protection is a factor that would justify the allocation of the investment portfolio in the future	Dichotomous variable
model_neant	the institutional does not use modeling	Dichotomous variable
model_determ	institutional uses a deterministic modeling	Dichotomous variable
model_determ_sensib	institutional uses a deterministic modeling with sensitivity analysis	Dichotomous variable
model_analscenar	institutional uses a modeling with scenario analysis	Dichotomous variable
model_stochas	the institutional uses stochastic modeling	Dichotomous variable
nivcompr_model	the level of understanding of each model used	ordinal
elab_hyp	assumptions discussed during the modeling phase	ordinal
courterm_intelec	short term is very comfortable intellectually for the institutional investor.	Dichotomous variable
courterm_opport	short term generates more interesting opportunities than the long-term	Dichotomous variable
courterm_lt_excesrisq	short term helps to avoid excessive risk-taking	Dichotomous variable
courterm_illiquid	the short term helps to avoid the risk of illiquidity	Dichotomous variable
courterm_autre	other advantages of a short-term investment policy	Dichotomous variable

interci_march	the institutional intervenes in the private equity directly in the market	dichotomous variable
intervci_fond	the institutional intervenes in private equity through funds	Dichotomous variable
intervci_fondfond	the institutional intervenes in private equity through funds of funds	Dichotomous variable
intervimmob_march	the institutional intervenes in real estate directly in the market	Dichotomous variable
intervimmob_fond	the institutional intervenes in real estate through funds	Dichotomous variable
intervimmob_fondfond	the institutional intervenes in real estate through funds of funds	Dichotomous variable
intervinfra_march	the institutional intervenes in the infrastructure directly in the market	Dichotomous variable
intervinfra_fond	the institutional intervenes in infrastructure through funds	Dichotomous variable
intervinfra_fondfond	the institutional intervenes in infrastructure through funds of funds	Dichotomous variable
topstrat_ci	the right strategy to make private equity profitable	nominal
segmt_immob_res	the institutional invests in the residential real estate segment	Dichotomous variable
segmt_fonc	the institutional invests in the commercial property segment	Dichotomous variable
segmt_locommer_burea	institutional invests in commercial premises and offices	Dichotomous variable
segmt_immob_autre	the institutional invests in other real estate segments	Dichotomous variable
ci_diverport	private equity makes it possible to diversify an investment portfolio	Dichotomous variable
ci_adoss_actifpassif	private equity allows assets to be matched with liabilities	Dichotomous variable
ci_exers_influenc	private equity can influence the operations of targeted companies	Dichotomous variable
ci_maxrend_rendabsolu	private equity maximizes absolute return	Dichotomous variable
ci_surperfo_class	private equity outperforms traditional assets on a risk-adjusted return basis	Dichotomous variable
ci_protrisque_march	private equity helps to protect against certain market risks	Dichotomous variable
ci_benef_fiscal	private equity generates a taxable profit	Dichotomous variable

infra_cashflo_stabl	infrastructure generates stable cash flows	Dichotomous variable
infra_saitpas	the institutional has no idea of the contribution that infrastructure can bring to the reserve management	Dichotomous variable
ci_info_bamancfcc	the institutional gets information on private equity through the BAM/ANCFCC	Dichotomous variable
ci_info_consultinvest	the institutional gets information on private equity through investment consultants	Dichotomous variable
ci_info_gestfond	the institutional gets information on private equity through fund managers	Dichotomous variable
ci_info_amic	the institutional gets information on private equity through AMIC	Dichotomous variable
ci_info_boursautre	the institutional obtains information on private equity through the Casablanca Stock Exchange	Dichotomous variable
immob_info_bamancfcc	the institutional obtains information on real estate through the BAM/ANCFCC	Dichotomous variable
immob_info_consultinvest	the institutional gets information on real estate through investment consultants	Dichotomous variable
immob_info_gestfond	the institutional gets information on real estate through the fund managers	Dichotomous variable
immob_info_amic	the institutional gets information on real estate through AMIC	Dichotomous variable
immob_info_boursautre	the institutional gets information on real estate through the Casablanca Stock Exchange	Dichotomous variable
infra_info_bamancfcc	the institutional obtains information on the infrastructure through the BAM/ANCFCC	Dichotomous variable
infra_info_consultinvest	the institutional gets information on the infrastructure through investment consultants	Dichotomous variable
infra_info_gestfond	the institutional gets information on the infrastructure through the fund managers	Dichotomous variable
infra_info_amic	the institutional obtains information on the infrastructure through AMIC	Dichotomous variable
infra_info_boursautre	the institutional gets information on infrastructure through the Casablanca Stock Exchange	Dichotomous variable
estim_rendci	return that the institutional estimates for private equity	ordinal
estim_rendimmob	return that the institutional estimates for real estate	ordinal
estim_rendinfra	return that the institutional estimates for the infrastructure	ordinal

Appendix 2: Summary of variables eliminated (VAF <25%) from the first part of the first study

Variable	centroid coordinates			Total (vector coordinates)		
	Dimension			Variance Represented		
	1	2	Mean	1	2	Total
type_strat_allocat	,027	,028	,027	,027	,006	,032
justichan_max_rend	,000	,018	,009	,000	,018	,018
justichan_actif_passif	,089	,019	,054	,089	,019	,108
justifchan_changperc_march	,041	,100	,070	,041	,100	,141
model_determ	,001	,063	,032	,001	,063	,064
model_determ_sensib	,083	,153	,118	,083	,153	,236
courterm_intelec	,011	,004	,007	,011	,004	,015
courterm_opport	,075	,032	,053	,075	,032	,106
portefclas_avers_risq	,092	,004	,048	,092	,004	,095
portefclas_etroit_march	,006	,031	,018	,006	,031	,037

Appendix 3: Score of organisms in the two-dimensional space of the first part of the first study

Organism name	Dimension	
	1	2
CNRA/RCAR	,305	,656
Organism A	-2,897	—,009
MAMDA/MCMA	-,197	—,931
SCR	,490	-1,681
AXA	,004	,791
Organism B	,236	—,168
CIMR	,582	1,939
Organism C	,735	-1,107
Wafa insurance	,483	,021
Organism D	,260	,489

Appendix 4: Quantity at 95% of the percentage of the total variance explained of 10000 ACPs constructed from totally independent variables

	Nombre de variables												
nbind	17	18	19	20	25	30	35	40	50	75	100	150	200
5	74.9	74.2	73.5	72.8	70.7	68.8	67.4	66.4	64.7	62.0	60.5	58.5	57.4
6	67.0	66.3	65.6	64.9	62.3	60.4	58.9	57.6	55.8	52.9	51.0	49.0	47.8
7	61.3	60.7	59.7	59.1	56.4	54.3	52.6	51.4	49.5	46.4	44.6	42.4	41.2
8	57.0	56.2	55.4	54.5	51.8	49.7	47.8	46.7	44.6	41.6	39.8	37.6	36.4
9	53.6	52.5	51.8	51.2	48.1	45.9	44.4	42.9	41.0	38.0	36.1	34.0	32.7
10	50.6	49.8	49.0	48.3	45.2	42.9	41.4	40.1	38.0	35.0	33.2	31.0	29.8
11	48.1	47.2	46.5	45.8	42.8	40.6	39.0	37.7	35.6	32.6	30.8	28.7	27.5
12	46.2	45.2	44.4	43.8	40.7	38.5	36.9	35.5	33.5	30.5	28.8	26.7	25.5
13	44.4	43.4	42.8	41.9	39.0	36.8	35.1	33.9	31.8	28.8	27.1	25.0	23.9
14	42.9	42.0	41.3	40.4	37.4	35.2	33.6	32.3	30.4	27.4	25.7	23.6	22.4
15	41.6	40.7	39.8	39.1	36.2	34.0	32.4	31.1	29.0	26.0	24.3	22.4	21.2
16	40.4	39.5	38.7	37.9	35.0	32.8	31.1	29.8	27.9	24.9	23.2	21.2	20.1
17	39.4	38.5	37.6	36.9	33.8	31.7	30.1	28.8	26.8	23.9	22.2	20.3	19.2
18	38.3	37.4	36.7	35.8	32.9	30.7	29.1	27.8	25.9	22.9	21.3	19.4	18.3
19	37.4	36.5	35.8	34.9	32.0	29.9	28.3	27.0	25.1	22.2	20.5	18.6	17.5
20	36.7	35.8	34.9	34.2	31.3	29.1	27.5	26.2	24.3	21.4	19.8	18.0	16.9
25	33.5	32.5	31.8	31.1	28.1	26.0	24.5	23.3	21.4	18.6	17.0	15.2	14.2
30	31.2	30.3	29.5	28.8	26.0	23.9	22.3	21.1	19.3	16.6	15.1	13.4	12.5
35	29.5	28.6	27.9	27.1	24.3	22.2	20.7	19.6	17.8	15.2	13.7	12.1	11.1
40	28.1	27.3	26.5	25.8	23.0	21.0	19.5	18.4	16.6	14.1	12.7	11.1	10.2
45	27.0	26.1	25.4	24.7	21.9	20.0	18.5	17.4	15.7	13.2	11.8	10.3	9.4
50	26.1	25.3	24.6	23.8	21.1	19.1	17.7	16.6	14.9	12.5	11.1	9.6	8.7
100	21.5	20.7	19.9	19.3	16.7	14.9	13.6	12.5	11.0	8.9	7.7	6.4	5.7

Appendix 5: Summary of variables eliminated (VAF <25%) from the second part of the first study

Variable	centroid coordinates			Total (vector coordinates)		
	Dimension			Dimension		
	1	2	Mean	1	2	Mean
type_strat_allocat	,014	,138	,076	,004	,057	,062
terr_immeu_actimmob	,057	,041	,049	,056	,036	,092
justichan_actif_passif	,000	,002	,001	,000	,002	,002
model_determ	,047	,103	,075	,047	,103	,150
courterm_intelec	,004	,057	,031	,004	,057	,062
courterm_opport	,000	,048	,024	,000	,048	,048
portefclas_avers_risq	,009	,064	,036	,009	,064	,073
portefclas_etroit_march	,031	,005	,018	,031	,005	,036

Appendix 6: Score of organisms in the two-dimensional space of the second part of the first study

Organism name	Dimension	
	1	2
CNRA/RCAR	-,299	-,888
MAMDA/MCMA	2,171	-1,475
SCR	1,073	1,317
AXA	-,577	-,817
B	-,169	,482
CIMR	-1,547	-,742
C	,097	1,636
wafa insurance	-,346	,415
D	-,403	,072

Appendix 7: Summary of variables eliminated (VAF <25%) from the second study

Variables	centroid coordinates			Total (vector coordinates)		
	Mean			Mean		
	1	2	Dimension	1	2	Dimension
intervimmob_march	,104	,009	,056	,104	,009	,113
intervinfra_march	,116	,086	,101	,116	,086	,201
segmt_immob_res	,131	,002	,066	,131	,002	,133
segmt_immob_autre	,001	,006	,004	,001	,006	,007
ci_exers_influenc	,226	,000	,113	,226	,000	,227
ci_maxrend_rendabsolu	,163	,028	,096	,163	,028	,191
ci_cashflo_stabl	,080	,014	,047	,080	,014	,094
immob_adoss_actifpassif	,211	,019	,115	,211	,019	,229
immob_exers_influenc	,080	,014	,047	,080	,014	,094
infra_benef_fiscal	,211	,000	,106	,211	,000	,212
ci_info_boursautre	,002	,156	,079	,002	,156	,159
immob_info_boursautre	,109	,039	,074	,109	,039	,149

Appendix 8: Score of organisms in the two-dimensional space of the second study

Organism name	Dimension	
	1	2
CNRA/RCAR	,484	,210
A	-2,255	1,223
MAMDA/MCMA	-,943	-,305
SCR	-,137	-,365
AXA	,759	,246
B	,966	-,406
CIMR	,883	2,052
C	-,755	-1,818
wafa insurance	,042	-,154
D	,955	-,685

Appendix 9: research questionnaire

Participant Information

Name of the person that is completing the questionnaire:
.....

Organization name: .....

Email address: .....

Question 1

What type of allocation strategy are you developing?

- ☐direct
- ☐ Investment in funds/funds of funds
- ☐ Both at the same time

Question 2

When building your investment portfolio, what type of approach do you use?

- ☐ You carry out a macroeconomic and geographical analysis of all economic sectors and select the financial assets that will make up your portfolio, within the sectors that offer the best prospects (Top-down approach)
- ☐ You give priority to the characteristics of financial securities before those of the sector, the company or the economic situation (bottom-up approach).
- ☐ A mixed approach (The two previous ones at the same time)

Question 3

What do you think about the use of optimization techniques (choose more than 1 if possible)?

- ☐ Reliable tool
- ☐ Useful tool
- ☐ Not useful
- ☐ Unreliable tool
- ☐Neutre about this technique

Question 4

How long has this investment strategy (see question 4) been in place?

- ☐ Less than a year
- ☐ 1 year - 3 years
- ☐ 3 years - 6 years
- ☐ More than 6 years old

Question 5

How often do you monitor your strategic asset allocation?

- ☐ Quarterly
- ☐ Annually
- ☐ Every 3 years
- ☐ More than every 3 years

Question 6
What factors do you consider when changing your portfolio allocation (choose more than 1 if possible)?

☐ Risk reduction
☐ Return maximization
☐ Matching assets with liabilities
☐ Changes in market perception
☐ Opening up to new asset classes
☐ Changes in legislation
☐ Inflation protection
☐Other
:……
……
…

Question 7
What key factor do you think would justify this change?

☐Risk reduction
☐ Return maximization
☐ Matching assets with liabilities
☐ Changes in market perception
☐ Opening up to new asset classes
☐ Changes in legislation
☐ Inflation protection
☐Other
:……
……
…

Question 8
What type of quantitative modeling do you use?

☐ None
☐ Deterministic modelling
☐ Deterministic modelling with sensitivity analysis
☐ Scenario analysis
☐ Stochastic modeling
☐Other
:……
……
…

Question 9
How do you rate the level of understanding of these models in your organization (see question 8)?

☐ Full understanding
☐ Basic understanding
☐ Limited comprehension
☐ No understanding

Question 10
How do you develop your modelling assumptions (return, volatility, correlation...)?

☐ All assumptions are discussed in detail
☐ Only key assumptions are discussed
☐ No discussion of assumptions

Question 11
In your opinion, what is the advantage of a short-term reserve investment policy?

☐ Short-term is very comfortable intellectually
☐ Contrary to the short term, the long term does not offer enough opportunities to be seized in the Moroccan market.
☐ Unlike the short term, the long term leads to excessive risk-taking
☐ The short term avoids significant liquidity risks
☐Other
:……
……
…

Question 12
Over which time horizon you make your projections?

☐ 1 year or less
☐ 1 - 3 years
☐ 3 - 5 years
☐ 5 - 10 years
☐ 10 - 20 years
☐>20 years

Question 13

What time horizon was given the most importance when making decisions about strategic asset allocation?

☐ 1 year or less
☐ 1 - 3 years
☐ 3 - 5 years
☐ 5 - 10 years
☐ 10 - 20 years
☐>20 years

Question 14
What are your annual liquidity needs (as a percentage of your portfolio)?

☐ Less than 15
☐ 15 – 35%
☐ 35 – 50%
☐ 50 – 60%
☐ 60 – 75%
☐ 75 – 100%

Question 15

How do you rate your organization's attitude to risk?

☐ Strong risk aversion
☐ Risk aversion
☐ Slight risk aversion / slight propensity to risk
☐ propensity to risk
☐ High propensity to risk

Question 16

What is your organization's attitude to major losses?

☐ It maintains its long-term vision and does not change its investment plan
☐ It makes a few changes to its investment plan
☐ It makes a lot of changes to its investment plan.

Question 17

In the current context, what investment strategy is your organization developing?

☐ It maintains its investments in mainly bond and money market securities and is diversifying very slightly in the equity compartment.
☐ It seeks to broaden its investment horizon and to add new assets to its portfolio.

Question 18

If it does not seek to explore other investment horizons, what do you think are the reasons? (Choose more than 1 if possible)

☐ Reserves depletion pressures
☐ Risk aversion
☐ Narrow markets and lack of investment opportunities
☐ Waiting and mistrust
☐ Legal pressures
☐Other
:……
……
…

Question 19

What is your knowledge level in relation to each of the following asset classes?

	Private Equity	**Real Estate**	**Infrastructure**
Perfectknowledge	☐	☐	☐
Good knowledge	☐	☐	☐
Averageknowledge	☐	☐	☐
Reducedknowledge	☐	☐	☐
No knowledge	☐	☐	☐

Question 20

Do you think these assets have a role to play in your asset allocation policy?

	Private Equity	**Real Estate**	**Infrastructure**
No role to play	☐	☐	☐
Small role to play	☐	☐	☐
A role that is just as important as other traditional assets	☐	☐	☐
Crucial role to play	☐	☐	☐

Question 21

In your opinion, what is the best strategy to adopt to make private equity investment profitable?

☐ Simply invest in medium-performing funds
☐ You have to be able to invest in the top quartile funds
☐ Private equity cannot be profitable
☐Other
:……
……
…

Question 22

If you believe that real estate has a role to play in the investment policy of your organizations, what segments of this asset market are you involved in? (Choose more than 1 if possible)

☐ Residential Real Estate
☐ Land
☐ Commercial & office space
☐ Other

Question 23

If the following assets have a role to play, what is their contribution to your organization's reserve management?

	Private Equity	Real Estate	Infrastructure
Access to sectors that are not represented in the classic portfolio / portfolio diversification	☐	☐	☐
Matching assets to liabilities	☐	☐	☐
Achieve performance by influencing the management and operation of the company.	☐	☐	☐
Maximizing return / achieving absolute return	☐	☐	☐
Outperforming traditional assets in terms of risk-adjusted returns	☐	☐	☐
Protection against certain market risks (including unanticipated inflation)	☐	☐	☐
Benefitfromtaxadvantages	☐	☐	☐
Generate stable cash flows	☐	☐	☐
You don't know	☐	☐	☐
Other:	☐	☐	☐

Question 24

Where do you get information about the following alternative assets?

	Private Equity	Real Estate	Infrastructure
Bank Al-maghrib /ANCFCC	☐	☐	☐
Investment Consultants	☐	☐	☐
Fund managers	☐	☐	☐
AMIC	☐	☐	☐
The stock market	☐	☐	☐
Other	☐	☐	☐

Question 25

What is your estimated annual return for the following alternative assets?

	<0%	0%-2%	2%-4%	4%-6%	6%-8%	8%-10%	10%-15%	>15%	Don't know
Private Equity	☐	☐	☐	☐	☐	☐	☐	☐	☐
Real Estate	☐	☐	☐	☐	☐	☐	☐	☐	☐
Infrastructure	☐	☐	☐	☐	☐	☐	☐	☐	☐