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Article

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Alternative Asset: Evidence from Moroccan Insurance and Pension Funds

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ABSTRACT

The goal of this paper is to provide a critical overview of Moroccan insurance/pension fund investments in alternative assets through data analysis techniques. The results show that the risk of reserve depletion and the investment restrictions imposed by the regulator are not the real reasons why insurance companies / pension funds in our database reduce their investments in the alternative asset market. The results also show that the barriers that deter Moroccan insurance/pension funds from alternative assets are of two kinds: the first are of a general nature and concern the whole world (not just Morocco), the second type of barriers are specific to the Moroccan context.

Introduction

What type of assets should be chosen and what proportion of reserves should be invested in each of them? These two issues are of great concern to the insurance / pension fund, as their stability and viability depend on a large extent of them. In this case, we can differentiate between two investment philosophies: the first refers to countries with an Anglo-Saxon financial background, namely the United States, England, Ireland, and the second to countries with a European financial tradition (Germany, France, Denmark, etc.). The countries in the second category carry the largest share of labor unions and are traditionally more concerned with their social image. As a result, they must follow certain constraints: Danish pension funds, for example, may not invest¹ more than 40% of their portfolio investments in risky assets; German pension funds must not invest more than 30% in European equities and 25% in the European real estate; Portuguese pension funds may not invest more than 50% of their investment in the European real estate; On the other hand, the Anglo-Saxon countries have no investment limitations and are constrained only by their spirit and their creativity.

These constraints have a direct impact on the performance of European pension funds, which are unable to invest in the best portfolios. This generates a deficit that the European pension funds will be able to handle if they were free in their investment choices.

¹ According to the United Nations Joint Staff Pension Fund, a Fund's Investment Goal is to achieve the highest possible return on investment consistent with the risk appetite of the Fund, in order to generate an investment return that at least matches the expected real rate of return objectives of the Fund over the long term.

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In the same spirit, Moroccan insurance and pension funds are beginning to wonder and think about their investments. They must also respect some restrictive investment constraints. For example, besides not having the possibility of making international investments or investing directly in unlisted companies, “**la Caisse Marocaine de Retraites (CMR)**”² must invest at least 50% in treasury bills, a maximum of 30% in stock exchanges, a maximum of 15% in Real Estate, and less than 5% in Private Equity.

Although these constraints are very restrictive since they are very limited to the classical financial market³ (in comparison with European⁴ practices), they were not particularly problematic in the past, as long as the classical financial markets (especially listed shares and treasury bills) were able to generate very attractive returns. However, in recent years, this same market has become much more moderate in terms of returns. As a result, Moroccan insurance and pension funds have begun to wonder about their investment policy. Indeed, the latter have to choose between a declining bond market, characterized by a sharp decline in interest rates (particularly the treasury bill market), a very narrow stock market that has been on a downward trend for several years, and finally a money market that by its nature does not generate strong returns. Moreover, the effects of this poor economic situation were soon felt, prompting most organizations to review their investment policy.

On the other hand, in recent months, we have witnessed a new dynamic that is beginning to take hold in the Moroccan social security sector and, above all, a certain awareness that has prompted pension funds and insurance companies to seek diversification into new asset classes (namely alternative assets⁵ “AA”). This new reality has been accompanied by the Moroccan public authorities by creating new investment vehicles to enrich the investment landscape (OPCI⁶ and OPCC⁷). However, and contrary to what one might think, this new trend remains very timid. Indeed, the AA investments of Moroccan pension funds and insurance companies are very substantial, and almost never exceed the investment thresholds allowed by the regulator, and more than that are very far away from them (with the exception of CMR, which exceeded the 5% limit granted for real estate investments at the end of 2019, and which was obliged to discuss with the public authorities to lower this investment constraint and set it at 15%). So, we believe that this is a particular investment behavior that we will try to elucidate by calling on Moroccan pension and insurance companies.

The problem we are trying to address here is legitimate, especially when we know that several Moroccan pension funds are in a bad shape and are planning to stop paying pensions in the coming years. Indeed, all stakeholders are engaged in a reflection process to save funds from bankruptcy⁸. In this case, our study will also seek to see whether the risk of reserve depletion has the consequence of naturally orienting the investments of Moroccan pension funds/insurance companies towards the classical financial market (listed shares, treasury bills and money market products)⁹, not only because they prefer these asset classes (much more liquid and less profitable), but also because they are under the pressure of reserve depletion that directs their investment.

The idea we seek to exploit in this paper is not fortuitous but is inspired by a series of work that has been published in the literature. For example, in a study entitled “Looking for alternatives: Pension Investment around the world, 2008 to 2017”, published by Ivashina and Lerner (2018), we find that there is a real international interest (statistically significant) by pension funds in AA. Indeed, for 61% of the countries studied by the authors, pension funds increased their exposure to AA by 50% over the study period. Moreover, pension funds in countries that did not change their investments considerably already had a fairly aggressive exposure to AA (of the order of 10%) at the outset. More specifically, pension funds in developed markets have moved on average from exposure to AA of 9.19% in 2008 to an exposure of 13.37% in 2017, while pension funds in emerging markets have moved from 5.98% to 10.30%. For Ivashina and Lerner (2018), the international interest in AA may have several reasons, among which we can mention: AA is much more attractive than it used to be, and there are many more and more profitable investment opportunities.

² The CMR is the largest pension fund in Morocco in addition to being the second largest Moroccan institutional investor.

³ The classical financial market generally includes listed shares, government bonds and money market products.

⁴ This gap is all the more significant when compared with Anglo-Saxon practices.

⁵ In the financial literature, everything that is not part of the classical financial market (listed shares, bonds and money market) belongs to the alternative asset market, and this also applies to Morocco. However, since the Moroccan financial market is very narrow, we only find private equity, real estate and infrastructure.

⁶ Organisme de Placement Collectif en Immobilier.

⁷ Organismes de Placement Collectif en Capital.

⁸ In 2016, the first pension reform called the parametric reform was launched and was able to absorb a large part of the pension deficit (in particular, the civil pension scheme [RPC] managed by the CMR). Among the key measures of this reform, we mention the increase in the retirement age (63 instead of 60), the decrease in pension rates, the increase in contribution rates, etc. However, despite all this goodwill, the reserve depletion risk is still present.

⁹ Traditional financial markets are naturally more liquid and more short-termist in comparison with AA.

On the other hand, classical financial market returns have decreased. Indeed, pension funds throughout the world are suffering the full impact of declining interest rates (for example, 10-year rates have crossed the 2% threshold in several countries), prompting them to seek much greater diversification. For the European Insurance and Occupational Pension Authority (EIOPA): “The low interest rate¹⁰ environment is a real challenge for pension funds and insurance companies. They must constantly be on the lookout for new long-term investment horizons to repay their commitments”¹¹. Finally, this change in the trend (low interest rate environment) has led to a new literature that has focused on the best practices to be followed by pension funds when they decide to invest in AA.

The problem we are trying to solve in this paper also finds its origin in a fundamental book in this field entitled: “Pioneering Portfolio Management”¹². This book examined the reasons for the remarkable financial success of a particular type of financial organization, namely Endowments¹³. According to the author, in 2014 and over 10 years, the Endowments had generated annualized returns of around 8.2% (mainly driven by their investments in AA), much more than a classical portfolio that is 60% invested in bonds and 40% invested in listed equities. This allowed them to absorb the subprime shock that caused the world's institutional investors to lose on average 3.5% of their annual return. For KAZEMI et al. (2016), among the reasons that explain the success of Endowments in the financial market, we find: a very aggressive allocation to AA, as well as acceptance and better management of liquidity risk¹⁴. In the same vein, Coyle and Mladina (2010) adds that the performance of Yale University (one of the largest Endowments) was essentially explained by two factors: a very diversified exposure to Equity, and an extraordinary performance of AA in general and Private Equity in particular.

By taking into consideration the available literature as well as the context in which Moroccan pension funds and insurance companies are evolving, we have decided to focus on AA as the objective of this work. The goal is to understand the reasons that prevent Moroccan pension funds and insurance companies from opening up to the AA universe (especially with regard to the market reality, which is quite complex): is it simply the investment constraints imposed by public authorities, or rather the risk of reserve depletion, or finally other more structural reasons? Therefore, the conundrum remains complete¹⁵. Consequently, we have decided to raise the following two questions:

- **What are the real reasons that drive Moroccan pension funds and insurance companies away from the AA market?**
- **What measures should be put in place to encourage these new vehicles as investment diversifiers?**

Finally, we believe that the paper we present here differs from the existing literature by quite a particular approach. Indeed, to the best of our knowledge, this is the first paper that starts from the existing literature to identify the various barriers in investing in AA. These same barriers will be used to create a research questionnaire that will be administered to the various Moroccan pension funds and insurance organizations, so that they can confirm or deny these same barriers in the Moroccan context. Also, to the best of our knowledge, the work we present here is the first of its kind that deals with the Moroccan context and presents a very comprehensive study of the pension funds' and insurance companies' investment in AA. This is very important in the current context, where it is necessary to rethink the social security system, which has been in difficulty for several years.

The remainder of the paper is organized as follows: Section 2 reviews prior literature. In section 3, we explain the methodological approach and the used data. Sections 4 and 5 describe the results of our research. Section 6 concludes and presents the theoretical and practical implications.

¹⁰ The authors showed that a 50-basis point decrease in interest rates for 5-year maturities corresponded to a (statistically insignificant) 25 basis point increase in the weight of the portfolio allocated to AA.

¹¹ This is taken from the article: "Looking for Alternatives: Pension Investments around the World, 2008 to 2017", co-authored by Victoria Ivashina and Josh Lerner in 2018.

¹² The book is written in 2009 by David Swensen, Yale University's chief investment officer.

¹³ The Endowments experience was particularly inspiring for us in writing the paper in general and the issue in particular.

¹⁴ For Pastor and Stambaugh (2001), liquidity is a wide and elusive term that usually denotes the ability to exchange large amounts easily, at a low cost and without changing prices.

¹⁵ The paper we are presenting here is by no means an additional attempt or proposal to reform the Moroccan social security system. We believe that it is a collective effort that would involve the majority of stakeholders, from the citizen to the top decision-maker.

Literature review

Alternative Assets: A Brief Literature Review of The Various Investment Barriers

The literature dealing with AA investment (private equity, real estate and infrastructure) is quite diverse and varied. Some have been interested in private equity, others in real estate or infrastructure and others in AA in general. Therefore, this literature review comes as a continuation of the previous section and as an initiation of the next ones. The goal is to discuss from a theoretical point of view the different barriers related to AA investment.

Private Equity

On the Private Equity side, Ljungqvist and Richardson (2003) have identified the stylized facts that contribute to the dynamics and performance of Private Equity. According to these authors, the timing and illiquidity of cash flows are crucial factors. Indeed, it would take more than three years to invest 56.9% of the capital allocated to the fund, more than six years to invest 90.5% of the capital and between eight and ten years for the internal rate of return (IRR)¹⁶ to become positive and possibly exceed that of listed assets. Ljungqvist and Richardson (2003) continues in the same vein by saying that the two factors that drive fund performance are the availability of investment opportunities in the financial market and competition¹⁷. Therefore, in this context, the authors found that there is an annual out-performance of Private Equity funds on listed assets. This same out-performance is due to the premium that remunerates the illiquidity of Private Equity as well as the skills of fund managers. Therefore, the investor must be very patient when investing in Private Equity to harvest the liquidity premium¹⁸ while developing a certain ability to identify the Top-quartile funds¹⁹ that generate the best returns in the market.

For Singh (2011), illiquidity is the Achilles heel of the Private Equity investment (it is one of the least liquid asset classes in the market). Therefore, the investor must ensure that this investment is consistent with his investment horizon, especially with the excessive use of debt (this will naturally add an extra dose of risk to the investment) as an additional source of financing. Also, For Kazemi et al. (2012), there are several ways to generate profits in the private equity industry. First, private equity investment is about finding opportunities in an uncertain, under-researched or neglected niches, where information is proprietary²⁰. A second potential opportunity is based on the benefits of restructuring where portfolio company structures and governance are shifted to more appropriate and efficient ownership models, etc. All this can only be done in the long term, thus confirming the liquidity risk cited by other authors. In the same vein, Kazemi et al. (2012) reported that Private Equity funds are illiquid, the secondary market for these assets is very opaque and very shallow, transactions are too rare, and sellers often act under duress. In critical periods when liquidity is in high demand, secondary markets tend to dry up. In addition, and after the investor enters the Private Equity industry, the investor loses control over the timing and maturity or the amount of cash flows. This complicates the task even further. Kazemi et al. (2012) also added that measuring performance in Private Equity is particularly difficult. Indeed, all the tools that are traditionally used to measure performance are no longer suitable in the context of Private Equity and do not draw a clear picture about performance.

Other risks in the case of private equity also need to be monitored, namely the Selective Reporting phenomenon²¹: For example, Phalippou and Gottschalg (2009) showed that Private Equity funds outperformed listed assets by three percent gross and underperformed listed assets by three percent net. The same authors tried to circumvent the Selective Reporting bias by constructing two fund samples (two portfolios): the first one is built by the authors and the second is collected from a commercial database (Preqin, Burgiss, etc.). The authors found that on average, there would be a 5% difference in performance between the two databases. Indeed, commercial databases (generally used by investors and researchers) tend to over-represent the best-performing funds.

¹⁶ For Joseph et al. (2010), the IRR is an interest rate that equals the current value of the cash flow to zero. It offers useful information about the return on the investment and its performance.

¹⁷ It is about the competition between investment funds to hold the best investment opportunities.

¹⁸ The liquidity premium means that illiquid assets need to deliver higher returns than liquid ones (which sell quickly without losing their value).

¹⁹ These are the investment funds that offer the market's highest returns.

²⁰ Indeed, the private equity industry is very opaque, and it is very difficult to find expressive, clear and accurate information.

²¹ The Selective Reporting phenomenon means that the best-performing funds will be over-represented in commercial databases, which will artificially inflate the performance of the asset class's performance.

Lopez et al. (2013) in turn proposed some descriptive statistics that describe the performance of Private Equity. They reported a median IRR of around 21% and a gross PME²² (Public Market Equivalent) of 1.3. The same authors also found that investing in the best-performing funds yielded a 50% IRR, unlike the worst-performing funds that may not yield anything. This means that it would be necessary to be able to identify the Top-quartile funds to achieve high returns. Conroy and Harris (2007) for their part showed that the attractiveness of Private Equity as an asset class is generally overestimated. Of course, the average net return (after deduction of management fees) is not as attractive as what is reported by practitioners and academics. For the authors, this overestimation is the result of the Selective Reporting bias. However, for Conroy and Harris (2007), this does not mean that Private Equity is a bad investment strategy, especially for those who have a certain agility in the choice, analysis and identification of the best deals (top quartile funds).

Therefore, based on the previous discussion, we can propose the following hypotheses:

H1²³: The various barriers that prevent the investor from engaging in the Private Equity market are: The Selective reporting phenomenon, the liquidity risk, the opacity of this market, and finally all the tools that are traditionally used to measure performance are no longer suitable in the context of Private Equity and do not draw a clear picture about performance.

Real Estate

On the Real Estate side, Baroni et al. (2008) has suggested some risks associated with Real Estate: “the lack of transparency and the traditional confidentiality that governs this industry, the heterogeneity²⁴, as well as the indivisibility which makes it very difficult to sell or buy the sizes that correspond to the Buyers'/ sellers' preferences”. For Kazemi et al. (2012), the Real Estate investment risks are: “the heterogeneity of investments, the indivisibility and its illiquid nature that makes it difficult to rebalance the portfolio²⁵ (especially the investment size)”. Gray and Ter Horst (2009) added that Real Estate helps to control portfolio risks as a result of its poor correlation with other assets. However, it is crucial to keep in mind the smoothing-risk phenomenon²⁶. By comparing the results of the Markovitz model²⁷ (which the authors calculated) with those of some institutional investors, the authors concluded that the weight of the Real Estate in Markovitz's portfolio is much higher. This proves that Real Estate data are quite smoothed, thus giving a false signal to the investors which should be processed before investing.

For Bond et al. (2006), it appears that the weighting of Real Estate in an investment portfolio decreases significantly when the return is adjusted for risk over a one-year investment horizon. For the same authors, this decline is not as significant when risk-adjusted returns are adjusted over longer periods; in this case five years (longer investment horizons seem to amortize the Real Estate risk). Therefore, for the author, liquidity risk is a factor that contributes partially to the low Real Estate allocations, but it is not the main factor behind it. (At least, for the database used by the authors.). Also, for Byrne (2006), Real Estates bring relative stability to the portfolio. However, they tend to generate very high transaction costs and fees in addition to being very illiquid. Therefore, Real Estate can generate a lot of returns, but, over the long term.

Also, Kazemi et al. (2012) have demonstrated that Real Estate brings many advantages to an investment portfolio, including generating stable cash flows and protecting a portfolio against inflation. Also, for Kazemi et al. (2012),

²² The PME is used to compare the performance of private funds with public indices. The metric basically adapts public market returns to an internal rate of return that accounts for cash flows that are unpredictable and fluctuating. It is intended to provide investors with a better comparison of private funds with public indices.

²³ For a detailed explanation of each concept, see the literature review.

²⁴ Real Estate is very heterogeneous, including office, residential, logistics, industrial, etc. Moreover, the investor can invest directly in the real estate market or through an investment fund (or possibly a fund of funds), in which case the risks would be different each time.

²⁵ For Tokat and Nelson (2007), the asset allocation of the portfolio determines the risk and return characteristics of the portfolio. In order to preserve its original risk and return characteristics over time, the portfolio needs to be rebalanced. In this case, rebalancing involves buying or selling assets in a portfolio regularly.

²⁶ The smoothing-risk phenomenon means that the yield curve over time will be artificially smoothed, which naturally reduces risk. As a result, the investor will think that the investment is much less risky than it actually is.

²⁷ The Markovitz model is a mathematical modeling of the investment portfolio selection problem. The output of this model is an efficient frontier that maps out the portfolios that offer the best return for a given risk. In this case, the Markovitz model will be addressed by solving the portfolio optimization problem, which consists of maximizing the return for a given risk.

investing in Real Estate helps to achieve certain objectives for the investor, namely: “generating absolute returns²⁸, protecting a portfolio against unexpected inflation, ensuring portfolio diversification (especially against traditional assets), and finally providing regular cash inflows”. However, these same advantages are not without cost (and especially for generating absolute returns, protecting a portfolio against unexpected inflation and ensuring portfolio diversification). Indeed, since this type of market is quite competitive, the market price will tend to adjust to demand, thereby reducing profits.

In turn, Hoesli et al. (2007) examined the speed at which economic shocks are incorporated into Real Estate return expectations. In this sense, the authors have shown (for the United States and the United Kingdom markets) that in the long term, Real Estate can protect a portfolio against expected inflation, as opposed to unanticipated inflation (contrary to what Kazemi et al. (2012) have argued). In the same vein, the authors have shown that information spreads rather slowly in the Real Estate market, and that any short-termist analysis of the Real Estate's market (particularly with regard to its ability to protect a portfolio against inflation) is flawed.

Therefore, based on the previous discussion, we can propose the following hypotheses:

H2²⁹: The various barriers that prevent the investor from engaging in the Real Estate market are: The lack of transparency, the very high transaction costs and fees, the illiquidity risk and finally the smoothing-risk phenomenon.

Infrastructure

On the Infrastructure side, Inderst (2009), identified some stylized facts that are specific to the Infrastructure investment, namely: the existence of barriers to entry and economics of scale. Indeed, very large initial investments are needed, which would immediately exclude most contenders from this form of investment. Furthermore, several projects will have already been established at the market level, thus creating economies of scale that are very difficult to catch up with new investment projects. Inderst (2009) added that the very inelastic demand for Infrastructure investment ensures the monopoly of price fixing, with meagre operating costs and a very long investment period (ranging from 25 to 99 years).

For Croce (2012), Infrastructure investment differs from other assets because of its risk characteristics. Indeed, this type of asset requires very large initial investments that most pension funds do not have. Croce (2012) also adds that available data on Infrastructure investment is very poor. This makes it difficult to assess risks and fully understand correlations with other assets. Without this type of information, pension funds are reluctant to invest in Infrastructure. Croce and Yermo (2013), in turn, believe that some barriers around the world prevent investors from entering into the realm of Infrastructure; examples including financing methods that are not suitable for all investors (only investors with huge funds can invest in this asset), regulatory barriers, and the lack of quality data to properly assess Infrastructure investment risk. In the same way, the authors point out the lack of international, official, and accurate data on Infrastructure investments. This type of information can be a real advantage for investors in the future who need to reassure themselves and compare their investments, especially when they make such investments (which are long-term and require very large amounts of money).

Kazemi et al. (2012) confirmed the idea of the poor information quality in the Infrastructure market by saying that Infrastructure investment shows a relatively low correlation with traditional assets. However, since the valuation of these assets is based on appreciation, volatility will generally be smoothed, as well as correlations with other asset classes. Indeed, this diversification power (low correlation with traditional assets) should be taken with great care, as the risks (correlations) may be underestimated. Kazemi et al. (2012) added that the Infrastructure investment characteristics are: a low cash flow volatility, resilience against economic downturns, an inelastic demand, a monopoly market position, a long-term investment horizon, an inflation protection, a low correlation with other assets, a very attractive risk-adjusted return, etc. In the same vein Kazemi et al. (2016) added that Infrastructure investments can drain portfolio returns. However, this should be put into perspective since not all Infrastructure sectors produce extraordinary returns. For example, investment in a mature regulated gas distribution service (Brownfield Project) will produce very low returns compared to investments in airports or ports.

Finally, for Finkenzeller et al. (2010), the direct Infrastructure investment requires considerable transaction time, which makes it impossible to react immediately to market trends. In addition, when investing in Infrastructure, long-term contracts are imposed on investors by public bodies, which considerably limits flexibility. Indeed, the very large

²⁸ An absolute return is a return that will always be positive regardless of market direction.

²⁹ For a detailed explanation of each concept, see the literature review.

size of Infrastructure projects prevents small funds from investing small portion of their portfolio in Infrastructure. In the same vein, Finkenzeller et al. (2010) added that Infrastructure is a relatively young, immature and illiquid asset class that does not have a secondary market.

Therefore, based on the previous discussion, we can propose the following hypotheses:

H3³⁰: The various barriers that prevent the investor from engaging in the Infrastructure market are: The existence of barriers to entry, the illiquidity risk, the lack of quality data, the very large size of the infrastructure lots and their indivisibility which limits portfolio diversification.

Methodology and Data

Sample and Questionnaires

To construct our questionnaire, we initially based ourselves on three main questionnaires that already exist in the literature: "Asset and Liability Modeling Questionnaire", "Private Equity Questionnaire" and "Asset Class Investing Risk Assessment Questionnaire". We took the framework of these three models in order to build our own questionnaire. The latter was reworked to take into consideration the existing literature and adapted to the specifics of Moroccan pension funds and insurance companies. Subsequently, as a test phase, we sent a first copy of our questionnaire to the AMIC (Association Marocaine des Investisseurs en Capital) and one of the Moroccan pension funds (which did not allow us to disclose its identity).

After some rectifications (especially on the advice of AMIC), we decided to begin the distribution process. For this purpose, we used the database that the AMIC prepared for us. Subsequently, we proceeded in two ways: either by distributing the questionnaire electronically, manually, or by organizing direct meetings with the managers.

Among the 11 questionnaires (with a response rate of 73%) that we obtained, only one of them was not operational. That left us with 10 out of 15 questionnaires to include in the analysis. Among the 10 respondents to our questionnaire, we found three pension funds: CMR, CIMR and CNRA/RCAR; six insurance companies: MAMDA/MCMA, Saham Assurance, Wafa Assurance, Marocaine & vie, BMCI Assurance and AXA Assurance; and a reinsurance company: SCR. However, in order to ensure confidentiality, we hid the names of several investors in the analysis phase; they didn't want to identify themselves in order to protect their market position. We consequently decided to replace their names with codes.

It is also quite legitimate to wonder about the size and representativeness of the population studied and, above all, about the validity of the conclusions we will draw from the analysis (for the Moroccan context). However, we are convinced that the size of the population studied is quite legitimate, insofar as the Moroccan social security system is divided between insurance/reinsurance companies (ALLIANZ MOROCCO, ATLANTA, AXA Assurance MAROC, MAMDA/MCMA³¹, RMA³², SAHAM Assurance, BMCI Assurance³³, Wafa Assurance, MAROCAINE & VIE, MUTUELLE ATTAMINE CHAABI, GRAS SAVOYE, SCR³⁴ and CAT³⁵ and MATU³⁶) and pension funds (CMR³⁷, CIMR³⁸, CNRA/RCAR³⁹ and CNSS⁴⁰). This finally makes us a total of 18 Moroccan pension/insurance companies. It should be noted, however, that the CNSS cannot integrate with our database insofar as, according to Article 30 of the Dahir concerning the Law-1-72-184 on 27/07/1972 relating to the social security system, the CNSS is required to deposit its funds with CDG⁴¹, with the exception of those necessary for its operation. For CAT and MATU, these are companies operating in non-life insurance who specialize in transport insurance. In summary, we end up with exactly 15 organisms to include in our database, and to which we sent our questionnaire.

30 For a detailed explanation of each concept, see the literature review.

31 MAMDA/MCMA : Mutuelle Agricole Marocaine d'Assurance / Mutuelle Centrale Marocaine d'Assurance.

32 RMA : Royale Marocaine d'Assurance.

33 BMCI : Banque marocaine pour le commerce et l'industrie.

34 SCR : Société Centrale de Réassurance.

35 CAT : Compagnie d'Assurances Transport.

36 MATU : Mutuelle d'Assurances des Transporteurs Unis.

37 CMR : Caisse Marocaine des Retraites.

38 CIMR : Caisse interprofessionnelle marocaine de retraites.

39 CNRA/RCAR : Caisse Nationale de Retraites et d'Assurances/ Régime Collectif d'Allocation de Retraite.

40 CNSS : Caisse Nationale de Sécurité Sociale.

41 CDG : Caisse de Dépôt et de Gestion.

Statistical Method

To analyze our database, we used two main approaches. For the first part entitled "Alternative assets: barriers and investment challenges", we used Multiple Correspondence Analysis⁴² (MCA). For the second part, which is entitled "Moroccan alternative assets: which reform projects", we used a descriptive approach without using a rigorous data analysis technique. The choice of these methods is not the result of chance but is subject to some considerations about the nature of the variables, as well as the interactions that may exist between them. For example, for the first part of the study, since we are working on a set of individuals (who are in our case pension/insurance companies) that are studied in relation to categorical variables⁴³, we used a MCA.

MCA: Theoretical Framework

The goal of an MCA is to synthesize a table presenting in its rows the individuals and in its columns categorical variables. All the information contained in this table will be studied through a metric called inertia (For more explanation, see further down on this page). The principle of the MCA is therefore to identify a small number of dimensions⁴⁴ summarizing the maximum amount of inertia contained in the database (since there are almost as many modalities as there are dimensions, we will generally use the first dimensions to interpret our database). Subsequently, each individual in the database and each modality⁴⁵ they take will be interpreted in relation to the different dimensions that have been selected.

These same dimensions will be built successively following an orthogonalization process. In this case, the first dimension will be the one that best summarizes the inertia. The second dimension will be the one that best summarizes the rest of the inertia, and so on.

To apply the MCA, we used the SPSS software. For more details, see Husson et al. (2009).

In MCA, we use the following mathematical notations:

- V_{ij} is the modality of the variable j taken by the individual i ;
- k_j is the number of modalities taken by the variable j ;
- $y_{ik} = 1$ if the individual takes the modality k of the variable j , $= 0$ otherwise;
- p_k is the proportion of individuals that have the k modality of the variable j ;
- $\frac{1}{I} = \text{Weight of each individual in the database, with } \sum \text{Weight} = 1$;
- $I * p_k = \sum y_{ik} = \text{number of individuals that have the } k \text{ modality of the variable } j$;
- $x_{ik} = y_{ik} / p_k$. Let us note that the x_{ik} of an individual increases as the modality he possesses is rare. in this case, we will have:

$$\sum \frac{x_{ik}}{I} = \frac{1}{I} \frac{\sum y_{ik}}{p_k} = \frac{1}{I} \frac{I * p_k}{p_k} = 1$$

- Since the MCA is working on centered data, we need to center x_{ik} . Therefore $x_{ik} - \frac{y_{ik}}{p_k} - 1$;

Let the distance between two individuals (i and i') be $d(i, i')^2$. In this case, if two individuals take the same modalities, the distance between them will be equal to zero. If two individuals have many modalities in common, the distance between them will be minimal. If out of two individuals, one has a very rare modality, the distance between them will be great. If two individuals have the same rare modality, the distance between them will be small.

⁴² For Abdi & Valentin (2007), Multiple Correspondence Analysis (MCA) is a correspondence analysis (CA) extension that allows one to describe the relationship patterns of many dependent categorical variables.

⁴³ A categorical variable (sometimes referred to as a nominal variable) is a variable which has two or more modalities, but the modalities are not necessarily ordered. Political affiliation, for example, is a categorical variable with three modalities (left, right and center) and the modalities are not intrinsically ordered.

⁴⁴ Catell rule (also known as the elbow rule) will be used for this purpose. The idea is to read the graph of the total inertia represented by dimensions and select the ones that occur before the elbow. For example, if the elbow is in the fourth dimension, three dimensions will be used for interpretation.

⁴⁵ A modality is a value that the variable can take. For example, the categorical variable sex can take two modalities, namely male and female.

$$d(i, i')^2 = \sum_j p_k (x_{ik} - x_{i'k})^2 = \sum_j p_k \left(\frac{y_{ik}}{p_k} - \frac{y_{i'k}}{p_k} \right)^2 = \frac{1}{p_k} \sum_j \frac{1}{p_k} (y_{ik} - y_{i'k})^2$$

Let the distance between the individual (i) and the gravity center⁴⁶ (G) be $d(i, G)^2$. An individual will move further and further away from the origin if he has rare modalities. Therefore, the total inertia is the weighted sum of the squares of the distances between individuals and the gravity center.

$$d(i, G)^2 = d(i, O)^2 = \sum_j p_k (x_{ik})^2 = \sum_j p_k \left(\frac{y_{ik}}{p_k} - 1 \right)^2$$

$$\text{Inertia} = \frac{1}{I} \sum_i d(i, O)^2 = \sum_j \left(\frac{1}{I} \sum_i p_k \left(\frac{y_{ik}}{p_k} - 1 \right)^2 \right)$$

Let us assume that two dimensions have been selected using the Catell rule. To start the interpretation, we must calculate the square correlation ratio between the coordinates of each individual and the two dimensions, and between each variable and the same two dimensions. Subsequently, we extract these ratios and draw a graph that maps the correlations of each variable with the two dimensions. We start by interpreting the variables with the highest correlation ratios.

Also let us notice that each individual will be at the barycenter of the modalities he possesses, and that each modality will be at the barycenter of the individuals who possess it:

$$G_S(k) = \sum_i \frac{y_{ik}}{I_k} * F_S(i) \text{ , For the modalities}^{47}$$

$$F_S(i) = \sum_j \frac{y_{ik}}{j} * G_S(k) \text{ , For individuals}^{48}$$

Consequently, each individual will be placed next to the modalities he possesses and on the opposite side of those he does not. In turn, each modality will be placed next to the individuals who possess it and on the opposite side of those who do not.

Alternative Assets: Barriers and Investment Challenges

Results Reading

To select the number of dimensions, we will use the Cattell rule (Cattell, 1960). For this, we will apply it to the graph of the total inertia represented by dimensions. The elbow, in this case, is at the level of the second dimension. This means that the total inertia explained by the first dimension is much more important than the total inertia that is explained by the second dimension. Therefore, because the first dimension represents just 0.27 of the total inertia (which seems insufficient to explain our set of variables), we have decided to focus on exhaustiveness and to use two dimensions to study our data base. Thus, the previous graph is as follows:

⁴⁶ The gravity center is confused with the origin since the MCA is working on centered data.

⁴⁷ $G_S(k)$ corresponds to the k-modality coordinate on the dimension "s", $F_S(i)$ corresponds to the coordinate of the individual "i" on the dimension "s", and $\sum_i \frac{y_{ik}}{I_k} * F_S(i)$ corresponds to the sum of the coordinates of the individuals taking the k-modality, divided by the number of individuals taking the same modality. Therefore, $G_S(k)$ is the average of individual's coordinates taking the k-modality. And consequently, each modality is placed at the barycenter of the individuals who possess it.

⁴⁸ $\sum_j y_{ik} * G_S(k)$ is the sum of the coordinates of the modalities taken by the individual "i" on the dimension "s", $\sum_j \frac{y_{ik}}{j} * G_S(k)$ is the average of the modality coordinates that individual "i" has on the dimension "s". Therefore, each individual will be at the barycenter of the modalities he possesses.

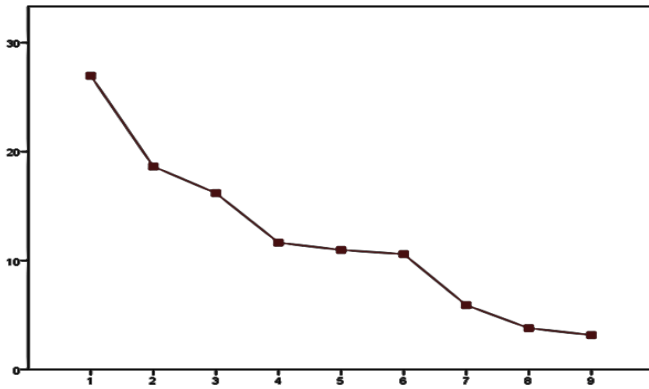


Figure 1. Summary of total inertia represented by dimensions

Also, table 1 shows that the two-dimension solution represents 0.456 of the total inertia (0.27 for the first and 0.186 for the second), thus confirming that the selected model has good explanatory power (the use of a two-dimensional MCA was relevant).

Table 1. Total inertia table

Dimension	Total (Eigenvalue)	Inertia
1	13,751	0,27
2	9,505	0,186
Total	23,256	0,456
Mean	11,628	0,228

The first step to starting the analysis would be to read the squared correlation table⁴⁹. Indeed, each dimension must be interpreted in terms of the variables with which they are sufficiently correlated. In this case, to say that a variable is sufficiently correlated with any dimension, the squared correlation must be at least equal to 0.5⁵⁰ (see Appendix 2 for more details). Thus, we find that the first dimension is closely related to the following variables: "pe_barri_narrowmarket ; pe_barri_difficultmesur ; pe_barri_youthindustri ; re_barri_hetroinvest ; infra_barri_narrowmarket ; infra_barri_jcurve ; infra_barri_difficultmesur and infra_barri_highloss ". These variables have high levels of correlation in the first (greater than 0,5) and are limited in the second. Therefore, for these twelve variables, the modalities are distant from each other along the first dimension only. Indeed, if we take the two variables "pe_barri_narrowmarket and infra_barri_narrowmarket" as examples, we can see that the MCA has divided our pension / insurance company database into two groups for each variable. The first group located in the positive quadrant were those who responded with a "yes," while the second group located in the negative quadrant alternatively responded "no." This discrimination applies to the twelve variables that have a high-squared correlation ratio in this first dimension.

⁴⁹ We preferred to read the squared correlation table instead of the graph that plots the correlations of each variable with the two dimensions (which is the same thing), since we have several variables in our database. Therefore, reading the graph with the naked eye in this case is difficult.

⁵⁰ This is the minimum ratio that we usually find in literature.

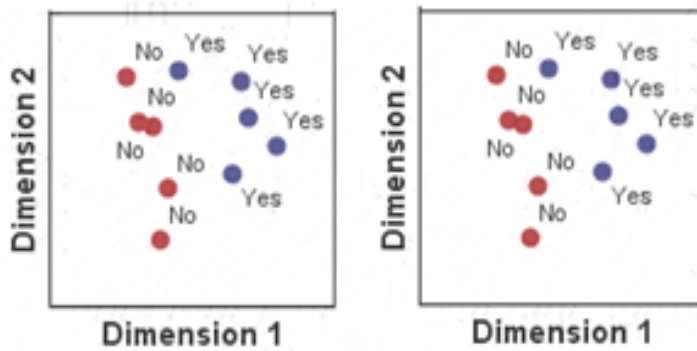


Figure 2. Responses of the studied organisms to the variables " pe_barri_narrowmarket and infra_barri_narrowmarket "respectively from left to right.

For its part, the second dimension is closely related to the following variables: " re_barri_lackprof_fund; infra_barri_youthindustri; infra_barri_lackprof_fund and other_mesure_challenge". These variables have high correlation ratio (greater than 0,5) in the second dimension and low levels in the first. Therefore, for these six variables, the modalities are distant from each other along the second dimension only. Indeed, if we take, for example, the following two variables " re_barri_lackprof_fund and infra_barri_lackprof_fund", we can see that the MCA divided our database into two groups for each variable. The first group located in the positive quadrant, who responded with a "no," and the second group located in the negative quadrant, who responded with a "yes." This discrimination applies to the five variables with a strong squared correlation ratio in this second dimension (more than 0,5).

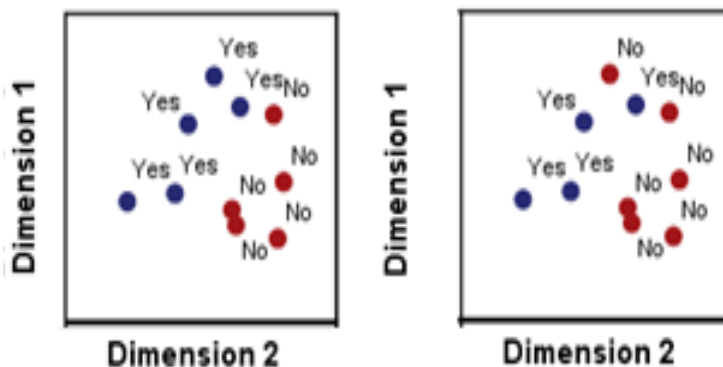


Figure 3. Responses of the studied organisms to the variables " re_barri_lackprof_fund and infra_barri_lackprof_fund " respectively from left to right.

For a more comprehensive description, we can refer to the table showing the coordinates of each of our database organisms in the two-dimensional space (see also Appendix 3 for more details). Thus, we can see that the first dimension opposed two groups, a first one which contains the following organisms: "CNRA/RCAR, AXA, organism D and organism B"; and a second one which contains the following organisms: "Wafa insurance, CIMR, organism C, SCR, MAMDA/MCMA and organism A".

Since under MCA, each individual is placed at the barycenter of the modalities he possesses, we can say that the first group is the one that thinks that the narrowness of the Moroccan private equity market (pe_barri_narrowmarket), the measurement difficulties related to private equity (pe_barri_difficultmesur), the youth of the private equity industry (pe_barri_youthindustri), the heterogeneity of the real estate investments (re_barri_hetroinvest), the narrowness of the infrastructure market in Morocco (infra_barri_narrowmarket), exposure to the 'J' curve⁵¹ in infrastructure (infra_barri_jcurve), the risk of high infrastructure losses (infra_barri_highloss) and the measurement difficulties related to infrastructure markets (infra_barri_difficultmesur) are all barriers that prevent this group from

⁵¹ J-curve is a curve that shows very large losses at the beginning which are followed by considerable gains. This type of curve is systematically observed in alternative assets, since they require considerable investments at the beginning, and it is only afterwards that the gains are harvested.

investing in the AA universe. The second group in the negative quadrant of the same dimension is not convinced that these barriers are the real reasons which prevent it from investing in AA.

The second dimension also opposed the first group consisting of the following organisms: "CNRA/RCAR, MAMDA/MCMA and organism A", to the second group consisting of the following organisms: "AXA, organism B, organism D, CIMR, SCR, organism C and Wafa insurance". Since under MCA, each individual is placed at the barycenter of the modalities he possesses, we may conclude that the first group is the one that believes that the youth of the infrastructure market (infra_barri_youthindustri), the lack of experience of investment funds investing in the real estate market (re_barri_lackprof_fund), the lack of experience of investment funds investing in the infrastructure market (infra_barri_lackprof_fund), as well as other measurement challenges specific to each organism (other_mesure_challenge) are all barriers that prevent this first group from investing in the AA market. We can also conclude that the second group of pension/insurance companies "AXA, organism B, organism D, CIMR, SCR, organism C and Wafa insurance" believe that the barriers we have listed for the first group are not the ones that prevent them from investing in the AA market.

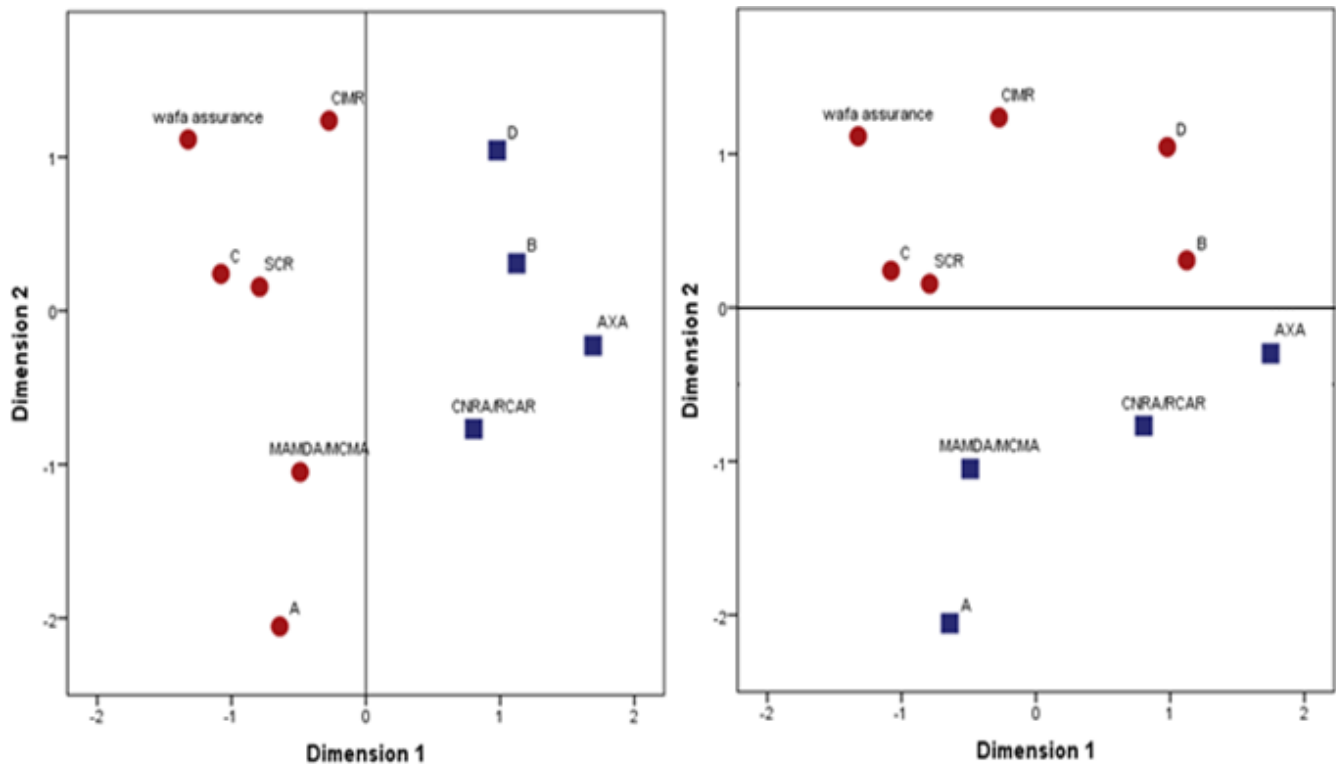


Figure 4. Organisms in the two-dimensional space

Discussion

We should point out that the risk of reserve depletion is not at all the reason why Moroccan insurance companies and pension funds avoid the AA market in our database. This is a very important conclusion, particularly when we know that the largest Moroccan pension fund, the CIMR has programmed the depletion of reserves for 2027. Other pension funds that are similarly relevant in terms of size, in this case the RCAR has scheduled the depletion of reserves for 2043. As a result, we initially thought that the liabilities of these funds, which are particularly heavy would lead them to limit their investments in AA and focus on the traditional assets market (which is much more liquid and much shorter-term oriented). We have shown from this analysis that this is not the case:

Table 2. database organism responses to the question “You avoid investing in AA due to the pressure of reserve depletion.”

Variable (reserves-deplet)	Number
no	10
yes	0

It should also be noted that the investment restrictions⁵² levied by the regulator are not the reasons that deter Moroccan pension funds and insurance companies from AA. The problem therefore lies in another level, which is far more connected to the nature of the AA investment itself, and, also, to the environment surrounding it in Morocco. It's finally not about the investment constraints nor the financial situation of the pension fund or the insurance company at the time of investment.

Table 3. database organism responses to the question “the constraints imposed by the regulator prevent you from investing sufficiently in the AA universe.”

Variable		Number
For Private Equity	no	8
	yes	2
For Real Estate	no	9
	yes	1
For Infrastructure	no	9
	yes	1

It is clear that the barriers that deter Moroccan insurance companies and pension funds from AA are of two kinds: the first are of a general nature and can be found almost anywhere in the world. We have seen for example through the first dimension⁵³ of the MCA that CNRA/RCAR, AXA, Organism D and Organism B suffer from the measurement difficulties related to private equity, exposure to the 'J' curve in infrastructure, the heterogeneity of real estate investments, measurement difficulties related to infrastructure, and the risk of high infrastructure losses. These are the risks that are inherent to the AA investment (everywhere in the world). As a result, the investor must be able to measure them correctly, but above all, to acknowledge and manage them.

The second type of barriers is specific to the Moroccan context: we have seen, for example, through the first dimension of the MCA that CNRA/RCAR, AXA, that Organism D and Organism B suffer from the narrowness of the Moroccan private equity market, the youth of the private equity industry, and the narrowness of the infrastructure market in Morocco. We have also seen through the second dimension of the MCA that AXA, CNRA/RCAR, MAMDA/MCMA and Organism A suffer from the youth of the infrastructure market, the lack of experience of investment funds investing in the real estate market and the lack of experience of investment funds investing in the infrastructure market. In conclusion, these are the characteristics that describe an embryonic and emerging market that needs to be supported. In this case, the Moroccan pension/insurance companies, being the largest institutional investors, should support this market during its first years so that it becomes much more mature over time.

It should also be mentioned that before we began our study, we had to remove six variables. The latter, by having a zero variance (the answers were the same for all Moroccan insurance and pension funds in our database), have no discrimination power. These variables are as follows:

⁵² For example, the CMR must invest a maximum of 15% of its portfolio in the real estate and 5% in private equity.

⁵³ For the second dimension of the MCA, it only identifies barriers that are specific to the Moroccan market.

Table 4. Variables eliminated from the MCA analysis (zero variances).

Variable	modality	Number	Variable	modality	Number
illiq_mesure_challenge	no	0	infra_barri_pooling	no	10
	yes	10		yes	0
defin_sellectreport_perf	no	10	re_barri_pooling	no	10
	yes	0		yes	0
infra_barri_hetroinvest	no	10	pe_barri_nondivisibl	no	10
	yes	0		yes	0

What we can retain from this table is that, with the exception of variable “illiq_mesure_challenge”, which should be given its full importance in interpretation since it concerns all the Moroccan pension funds and insurance companies in our database, all the other variables are not interpretable because they do not concern any organization in our database. As a result, what we can say is that all the organisms in our database have great difficulty measuring the liquidity level of AA (illiq_mesure_challenge). In the available financial literature, measuring the liquidity of an asset (whether traditional or alternative) has always been a real challenge. This is even more complicated since AA evolves in a completely different universe (compared to traditional assets), whose rules, measurement methods and analysis tools are completely different. For Kazemi et al. (2016), investing in AA is a real challenge for fund managers due to the uncertainty regarding timing and the amount of future cash flows. For the same authors, AA (private equity, real estate and infrastructure) are characterized by a structural illiquidity. This illiquidity is the result of the lock-up period in the first few years, which makes it impossible to withdraw from investments during this period without incurring large losses (the J-curve phenomena).

We should also mention that we removed several variables from our MCA analysis since they are not sufficiently discriminating. Indeed, the majority of organizations in our database answered these variables in the same way (see Appendix 4 for more details). In summary, these variables are of two kinds (see Appendix 4 for more details): some are not interpretable because they do not concern most of the organizations in our database, while others (written in bold type) concern almost all of the organizations. They should therefore be interpreted carefully. These variables are as follows: « **pe_barri_disapo_retun**, **pe_barri_lackprof_fund**, **pe_barri_illiquid**, **re_barri_illiquid**, **infra_barri_illiquid**, **exess_managfees** and **difficmodel_opac** ».

The first thing we can say is that the overwhelming majority of the organizations in our database complain a lot about the management fees in the AA universe that can be very heavy (**exess_managfees**). As a result, they are a huge burden on distributed returns (even if the returns are very attractive on a gross basis). Indeed, the investor will only receive a net return, which can deter him from AA investments. This conclusion has also been mentioned in the literature: for example, for Phalippou and Gottschalg (2009), Private Equity funds outperformed listed assets by three percent gross, and underperformed listed assets by three percent net. For Conroy and Harris (2007), the attractiveness of Private Equity as an asset class is generally overestimated. Indeed, the average net return (after management fees payment) is not as attractive as what is reported by practitioners and academics. Also, for Byrne (2006), Real Estates bring relative stability to the portfolio. However, they tend to generate very high transaction costs and fees, in addition to being very illiquid.

Secondly, what we also need to note is that the vast majority of companies in our database find it very difficult to quantify risks and model AA returns (**difficmodel_opac**). In the same vein, they complain about the lack of experience of investment funds investing in the private equity market (**pe_barri_lackprof_fund**)⁵⁴. These two difficulties are probably the consequence of the market's youth. Therefore, in order to overcome them, it would be important to support this market while being very careful so that it matures over time.

The final comment we can make is that we find that several organizations in our database complain a lot about the inherent illiquidity of AA investments (**pe_barri_illiquid**, **re_barri_illiquid**, **infra_barri_illiquid**). This is a risk that needs to be accepted and managed internally. Indeed, AA investment is illiquid in nature and above all long-term oriented. For Private Equity, for example Kazemi et al. (2012) believe that there are several ways to generate profit in Private Equity: first, Private Equity investment is about finding opportunities in an uncertain, under-researched or

⁵⁴ This consolidates what we have said with regard to the interpretation of the second dimension of the MCA. Indeed, we have found that several organizations in our database complain about the lack of professionalism of investment funds specializing in Moroccan real estate and infrastructure.

neglected niche, where information is proprietary⁵⁵. A second potential opportunity is based on the benefits of restructuring where portfolio company structures and governance are shifted to more appropriate and efficient ownership models, etc. Clearly, this can only be achieved in the long term, thus implying a significant liquidity risk. It should also be noted that the AA illiquidity nature is probably the result of what we said earlier. Indeed, when assessing the illiquidity level of AA, we have seen that all companies in our database have considerable difficulty. Let's finally finish by saying that the illiquid nature of AA has been much discussed in the literature: for example, on the Private Equity side, Ljungqvist and Richardson (2003) discussed the stylized facts of private equity investments. According to these authors, the timing and illiquidity of cash flows are crucial factors. Indeed, it would take more than three years to invest 56.9% of the capital allocated to the fund, more than six years to invest 90.5% of the capital, and between eight and ten years for the Internal Rate of Return (IRR) to become positive and possibly exceed that of listed assets. On the Infrastructure side, for Kazemi et al. (2012), infrastructure is an illiquid asset that is characterized by a certain resilience to economic downturns and a long-term investment horizon.

To conclude, we can say with regard to the first hypothesis⁵⁶ concerning the private equity market that we were able to confirm the following investment barriers, namely: the liquidity risk, the opacity of the private equity market, and finally all the tools that are traditionally used to measure performance are no longer suitable in the context of Private Equity and do not draw a clear picture about performance. With regards to the second hypothesis concerning the real estate market, we were able to confirm the following investment barriers, namely: the lack of transparency, the very high transaction costs and fees and the liquidity risk. Finally, with regard to the third hypothesis concerning the infrastructure market, we were able to confirm the following investment barriers, namely: the liquidity risk, and the lack of quality data in the infrastructure market.

After identifying (as much as possible) the barriers that prevent the Moroccan pension funds and insurance companies from investing sufficiently in AA, a logical next step would be to discuss ways to improve this ecosystem, which would make it a far more attractive market. Therefore, the goal of the second section would be to discuss this point.

Moroccan Alternative Assets: Which Reform Areas?

At this level, as highlighted in the working methodology, we will read the responses of pension funds and insurance companies, interpret them, and finally try as much as possible to extract the salient features of a more efficient Moroccan AA market. Thus, we can see that it is very important to prepare a more advantageous tax environment for AA in Morocco. Indeed, pension funds and insurance companies in our database are putting this measure at the forefront of the reform projects (70% think it is a very important measure and 30% think it is an important one). In this case, the abolition of registration fees that are charged when selling unlisted shares is one of the measures that have been most appreciated by Moroccan investors. (This law was adopted at the time of the 2018 Finance Act and renewed in 2019. For more details, see General Tax Code, Article 129-IV-25 °). In addition, the regulator also provides some advantages for the OPCI⁵⁷ investments, such as the 50% exemption from capital gains tax for contributions of property (see circular 02/18 of the Moroccan Capital Market Authority on OPCI management companies). For pension funds and insurance companies in our database, it would be interesting to extend this advantage beyond 2020, so that they can become familiar with this new vehicle, and especially to assist it during its first years in the market.

However, the tax environment governing AA in Morocco remains highly perfectible. Indeed, Moroccan investors in general argue that the investor should no longer be solely in charge of the value-added tax (TVA) applied to management fees. On the other hand, Moroccan investors also believe that the legal texts are not precisely defined. It would, therefore, be interesting to prepare a more precise legislative and informative framework and to ensure greater legal security.

For the pension funds and insurance companies in our database, it is also important to supervise investment funds by technical experts. For them, investment funds and fund managers, in general are inexperienced (as mentioned above). They would benefit from expert guidance, especially when venturing into projects requiring special knowledge. Consequently, the latter will be able to complete their financial knowledge and build their technical expertise (this support is necessary, especially in relation to activity monitoring, team selection, etc.).

⁵⁵ In Private Equity, it is very difficult to find expressive, clear and accurate information.

⁵⁶ To review the three hypotheses, see pages 5 and 6.

⁵⁷ Organismes de Placement Collectif en Immobilier.

It is also very important to ensure greater transparency and readability of the AA market. The AA market's opacity has a double impact on investors, since, on the one hand, investment funds are not required by the regulator to be very transparent (in any case much less than listed shares), on the other hand, the market does not provide investors with indices (benchmarks) that allow a good understanding of the market's evolution. On the private equity side, we can also identify a third opacity source at the level of a company. Actually, this opacity is a real advantage since it allows companies to avoid the transparency constraints, and thus focus on their core business. In the United States for example, several companies are considering in the future withdrawing from the stock exchange because of the transparency constraints that have a direct impact on their results. In Morocco, it is a different story. Indeed, the investment fund suffers from this opacity differently since some Moroccan companies (usually SMEs) under-report their earnings. This considerably reduces the number of interesting targets given the selective criteria required by investment funds and donors.

For Moroccan pension funds and insurance companies in our database, it is also very important to launch the OPCI (*Organisme de Placement Collectif en Immobilier*⁵⁸) and make it operational as soon as possible. These new vehicles have several advantages, including transparency. Indeed, the OPCI will be subject to strict control by financial market authorities, in addition to being very diversified. Indeed, investing in an OPCI means for the investor to acquire stakes in several real estate projects for rental purposes, and not to acquire real estate projects directly. This will naturally enhance the diversification power of the investment. Moreover, the OPCI will improve the investment's liquidity, since it is easier to sell equity investments on the market than a large real estate project.

Finally, for the pension funds and insurance companies in our database, it is very important to improve the entire private equity financing chain. In this sense, Morocco has taken a step forward by moving from the OPCR (*Organismes de Placement en Capital-Risque*) (law n° 41-05) to OPCC (*Organismes de Placement Collectif en Capital*) (law n° 18-14). Before that, investors had to invest in vehicles (OPCR) that devote at least 50% of their portfolio to small-and-medium-sized enterprises (SME)⁵⁹. This is not necessarily appropriate for all investors especially for those who prefer less risky and more mature companies. Thus, this new legislation completes the private equity supply armada in Morocco⁶⁰. However, the weakest point in this ecosystem is most certainly the seed capital. The AMIC (*Association Marocaine des Investisseurs en Capital*) in its report on the seed capital environment (published in 2018) identified the reasons behind these difficulties; for example, there is not a clear legal definition of the Moroccan Startup, the judicial liquidation procedures related to the OPCC that invest in seed capital are very cumbersome, etc. At the same time, AMIC has developed a roadmap, which can be seen as the starting point to properly support this segment of private equity.

Conclusion

In the current context, that is, a low-interest rate environment, a very narrow and declining stock market, and above all a depletion reserve risk, which was followed by the lack of visibility surrounding future reforms, the issue of diversification and opening up to new asset classes, namely AA, has never been more important in the Moroccan context. In this case, our research will have a practical implication insofar as it comes to demystify each AA class, to clearly identify the investment barriers that describe each one of them, and finally to possibly guide the decisions of the Moroccan regulator, the pension funds and the insurance companies. Indeed, we believe that this paper draws a clear picture of the different barriers regarding the Moroccan AA investment, and thus discusses ways of improvement.

Our research also has theoretical implications. To our knowledge, this is the first research that provides a comprehensive study of Moroccan pension funds/insurance companies' investments in the AA universe (private equity, real estate and infrastructure). In this sense, we have seen that the investment obstacles faced by Moroccan pension funds / insurance companies are of two kinds: the first is of a general nature (is present just about everywhere in the world), relates to the inherent nature of AA investment and has been described by several authors in the financial literature (Singh, 2011; Conroy & Harris, 2007; Baroni et al. 2008; Byrne, 2006; Kazemi et al. 2012; Finkenzeller et al. 2010; etc.). We have seen, for example, in the literature review that AA is a much longer-term investment asset, requiring different know-how and much higher management fees, etc.

⁵⁸ The OPCI officially started in Morocco on 11 June 2019, three years after the adoption of Law No. 70-14 by the Moroccan Parliament.

⁵⁹ In the new law, the OPCC must allocate 50% of its investment portfolio to unlisted companies regardless of their size.

⁶⁰ In OPCC, the investor can diversify within the same market segment.

The second type of barrier is much more endemic and depends on the investment context in which each AA evolves (not identified by the authors in the financial literature). Indeed, we saw in our study that in the Moroccan context, several pension funds and insurance companies suffer from the lack of professionalism of investment funds that operate in the real estate market, from the youth of the infrastructure market and from the lack of professionalism of investment funds that operate in the infrastructure market. This means that each AA market has its own specificities (from one country to another): not all countries have the same AA investment vehicles, do not have the same regulation, are not at the same development stage when it comes to the transaction number, the number of investment funds that operate in the market, their experience and know-how, etc. USA, for example, has a very deep and mature AA market, unlike Morocco, where the AA market is at the embryonic stage. Consequently, we cannot necessarily speak about the same investment barriers other than those related to the intrinsic nature of the AA investment itself (long-term nature, high management fees, etc.).

Finally, we think that the paper we propose here opens the field to new research. Indeed, we think that a logical next step would be to study mathematically the investments of a pension or insurance company (i.e. CMR, RCAR, CIMR, etc.), in order to weigh up the contribution of each one of the AA classes to an investment portfolio. We believe that this is a promising field of investigation that would allow us to complete our research, and at the same time invalidate or confirm it.

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Appendix 1: Data dictionary

Variable	Variable meaning	Variable	Variable meaning	Variable	Variable meaning
organism name	the organism's name	re_barri_hetroinvest	the heterogeneity of investments is a barrier to investment in real estate	infra_barri_youthindustry	the youth of the industry is a barrier to infrastructure investment
reserves-deplet	the pressure of reserve depletion is one of the reasons that prevent the pension/insurance company from investing in alternative assets	re_barri_nondivisibl	non-divisibility of assets is a barrier to investment in real estate	infra_barri_lackprof_fund	lack of professionalism of investment funds is a barrier to investment in infrastructure
pe_barri_comple_xindustr	the complexity of the industry and untrained personnel are barriers to private equity investments	re_barri_narrow market	the narrowness of the market is a barrier to investment in real estate	infra_barri_lacktransp	lack of transparency is a barrier to investment in infrastructure
pe_barri_reglegal	the unfavorable legal and regulatory environment are barriers to private equity investments	re_barri_jcurve	the "J" curve is a barrier to real estate investment	infra_barri_pooling	Pooling risk (the lock-up period) is a barrier to investment in infrastructure
pe_barri_hetroinvest	the heterogeneity of investments is a barrier to investment in private equity	re_barri_youthindustry	the youth of the industry is a barrier to real estate investment	infra_barri_illiquid	low liquidity and difficulty in rebalancing the portfolio are barriers to investment in infrastructure
pe_barri_nondivisibl	non-divisibility of assets is a barrier to investment in private equity	re_barri_lackprof_of_fund	lack of professionalism of investment funds is a barrier to investing in real estate	infra_barri_highloss	high risk of loss is a barrier to infrastructure investment
pe_barri_narrow market	the narrowness of the market is a barrier to a private equity investment	re_barri_lacktransp	lack of transparency is a barrier to real estate investment	excess_management_fees	management fees charged by the funds are excessive
pe_barri_jcurve	the "J" curve is a barrier to a private equity investment	re_barri_pooling	the Pooling risk (the lock-up period) is a barrier to investing in real estate	difficmodel_lack_knowledge	modeling difficulties is the result of a lack of knowledge about alternative assets
pe_barri_difficultmesur	the difficulty of measurement is a barrier to a private equity investment	re_barri_illiquid	low liquidity and difficulty in rebalancing the portfolio are barriers to investing in real estate	difficmodel_opac	modeling difficulties is the result of difficulties related to the alternative asset industry itself (opacity, lack of market depth, etc.)
pe_barri_youthindustry	the youth of the industry is a barrier to a private equity investment	infra_barri_complexindustry	the complexity of the industry and untrained personnel are barriers to infrastructure investment	difficmodel_index	the modeling difficulties are the consequence of the unavailability of a representative index of alternative asset market
pe_barri_lackprof_fund	lack of professionalism of investment funds is a barrier to a private equity investment	infra_barri_disappointreturn	Disappointments in relation to past performance are barriers to investment in infrastructure	define_sell_report_perf	selective-reporting (selection bias) define the persistence of the performance of alternative assets funds
pe_barri_lacktransp	lack of transparency is a barrier to a private equity investment	infra_barri_reglegal	the unfavorable legal and regulatory environment are barriers to infrastructure investment	illiquidity_measurement_challenges	illiquidity is one of the most significant measurement challenges facing the alternative asset industry
pe_barri_pooling	Pooling risk (the lock-up period) is a barrier to a private equity investment	infra_barri_hetroinvest	the heterogeneity of investments is a barrier to investment in infrastructure	obsolete_pricing_challenge	obsolete pricing is one of the most significant measurement challenges facing the alternative asset industry

pe_barri_illiquid	low liquidity and difficulty in rebalancing the portfolio are barriers to investing in private equity	infra_barri_nondivisibl	non-divisibility of assets is a barrier to investment in infrastructure	selfreport_mesure_challenge	self-reporting is one of the most significant measurement challenges facing the alternative asset industry
re_barri_complexindustr	the complexity of the industry and untrained personnel are barriers to a private equity investment	infra_barri_narrowmarket	the narrowness of the market is a barrier to investment in infrastructure	assyminfo_r_mesure_challenge	information asymmetry is one of the most significant measurement challenges facing the alternative asset industry
re_barri_disapo_retun	disappointments in relation to past returns are barriers to investing in real estate	infra_barri_jcurve	the "J" curve is a barrier to infrastructure investment	period_mesure_challenge	periodicity of returns is one of the most significant measurement challenges facing the alternative asset industry
re_barri_regllegalal	the unfavorable legal and regulatory environment are barriers to a real estate investment	infra_barri_difficultmesur	the difficulty of measurement is a barrier to infrastructure investment	effic_mesure_challenge	market efficiency is one of the most significant measurement challenges facing the alternative asset industry
				other_mesure_challenge	other measurement challenges facing the alternative asset industry

Appendix 2: Table of squared correlations in the MCA

Variable	Dimension		Mean
	1	2	
pe_barri_complexindustr	0,335	0,167	0,251
pe_barri_regllegal	0,496	0	0,248
pe_barri_hetroinvest	0,14	0,01	0,075
pe_barri_narrowmarket	0,748	0,102	0,425
pe_barri_jcurve	0,3	0,002	0,151
pe_barri_difficultmesur	0,748	0,102	0,425
pe_barri_youthindustr	0,748	0,102	0,425
pe_barri_lackprof_fund	0,031	0,325	0,178
pe_barri_lacktransp	0,106	0,121	0,114
pe_barri_pooling	0,318	0,006	0,162
pe_barri_illiquid	0,5	0,314	0,408
immob_barri_complexindustr	0,002	0,498	0,25
immob_barri_disapo_retun	0,232	0,013	0,123
immob_barri_regllegal	0,14	0,01	0,075
immob_barri_hetroinvest	0,686	0,06	0,373
immob_barri_nondivisibl	0	0,024	0,012
immob_barri_narrowmarket	0,011	0,337	0,174
immob_barri_jcurve	0,318	0,006	0,162
immob_barri_youthindustr	0,011	0,337	0,174
immob_barri_lackprof_fund	0,248	0,575	0,411
immob_barri_lacktransp	0,106	0,121	0,114
immob_barri_illiquid	0,5	0,314	0,408
infra_barri_complexindustr	0,005	0,11	0,057

Variable	Dimension		Mean
	1	2	
infra_barri_disapo_retun	0,106	0,121	0,114
infra_barri_regllegal	0,027	0,122	0,074
infra_barri_nondivisibl	0,318	0,006	0,162
infra_barri_narrowmarket	0,748	0,102	0,425
infra_barri_jcurve	0,575	0	0,288
infra_barri_difficultmesur	0,748	0,102	0,425
infra_barri_youthindustri	0,011	0,571	0,291
infra_barri_lackprof_fund	0,026	0,529	0,278
infra_barri_lacktransp	0,003	0,197	0,1
infra_barri_illiquid	0,499	0,314	0,408
infra_barri_highloss	0,686	0,06	0,373
exess_managfees	0,046	0,469	0,257
difficmodel_lack_knowledge	0,015	0,191	0,103
difficmodel_opac	0,046	0,469	0,257
difficmodel_index	0,08	0,128	0,104
obsprice_mesure_challenge	0,054	0,007	0,03
selfreport_mesure_challenge	0,205	0,272	0,238
assyminfor_mesure_challenge	0,01	0,099	0,054
period_mesure_challenge	0,025	0,329	0,177
effic_mesure_challenge	0,261	0,02	0,141
other_mesure_challenge	0,018	0,549	0,284

Appendix 3: Database organisms coordinates in the two-dimensional space

Individual	Dimension	
	1	2
CNRA/RCAR	0,803	-0,772
A	-0,641	-2,054
MAMDA/MCMA	-0,489	-1,048
SCR	-0,791	0,151
AXA	1,693	-0,228
B	1,124	0,322
CIMR	-0,274	1,242
C	-1,08	0,237
Wafa assurance	-1,324	1,117
D	0,978	1,032

Appendix 4: Organisms' responses to the non-discriminatory variables eliminated from the MCA

Variable		Nombre
pe_barri_complexindustr	no	6
	yes	4
pe_barri_regllegal	no	8
	yes	2
pe_barri_hetroinvest	no	9
	yes	1
pe_barri_jcurve	no	6
	yes	4
pe_barri_lackprof_fund	no	2
	yes	8
pe_barri_lacktransp	no	9
	yes	1
pe_barri_pooling	no	9
	yes	1
pe_barri_illiquid	no	4
	yes	6
re_barri_complexindustr	no	8
	yes	2
re_barri_disapo_retun	no	8
	yes	2
re_barri_regllegal	no	9
	yes	1
re_barri_nondivisibl	no	8
	yes	2
re_barri_narrowmarket	no	7
	yes	3
re_barri_jcurve	no	9
	yes	1
re_barri_youthindustri	no	7
	yes	3
re_barri_lacktransp	no	9
	yes	1
re_barri_illiquid	no	4
	yes	6
infra_barri_complexindustr	no	6
	yes	4
infra_barri_disapo_retun	no	9
	yes	1
infra_barri_regllegal	no	9
	yes	1
infra_barri_nondivisibl	no	9
	yes	1

infra_barri_lacktransp	no	6
	yes	4
infra_barri_illiquid	no	4
	yes	6
exess_managfees	no	1
	yes	9
difficmodel_lack_knowledge	no	8
	yes	2
difficmodel_opac	no	1
	yes	9
difficmodel_index	no	5
	yes	5
obsprice_measure_challenge	no	7
	yes	3
selfreport_measure_challenge	no	6
	yes	4
assyminform_measure_challenge	no	5
	yes	5
period_measure_challenge	no	6
	yes	4
effic_measure_challenge	no	5
	yes	5