

Research program:
“Optimal Pension Plans for Pension Fund”

Annex Code 7

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Research subject

A Pension Fund is an institutional investor, which offers to its subscribers a set of investment strategies. Such pension plans differ predominantly, but not uniquely, according to the risk/reward profile of the investor.

Each investment strategy will offer a reward or a capitalization structure depending on the market benchmark associated to each of them: the Pension Fund manages the benchmark return generated by the funds. The Pension Fund decision is based on the weight of each benchmark in each pension plan.

Nowadays, this kind of decisions is essentially qualitative and often considers a restricted set of investment classes. The project, through a two-step approach, consists of the implementation of an optimization model suggesting the optimal mix of pension plans. Such model aims to reduce the existing methodological gap between the models applied by the Italian Pension Funds and those adopted by other countries. The first step consists in a rigorous statistical analysis of the employees' population to identify the most characterizing features in a pension investment perspective. The characterizing features such as risk/reward profile, salary, expected remaining working time and others are studied in order to evaluate their impact on the portfolio allocation of each employee. The results are clusterized to identify some representative employees representing the entire population. The aim of the first step is to suggest the optimal number of representatives according to the cardinality of the pension plans wanted by the Pension Fund and according to the statistical significance of the obtained clusters. The second step consists in the implementation of an optimization model able to define the best investment strategy for each representative. Such model requires a stochastic formulation in order to consider the financial market uncertainty and requires a multistage structure to deal with an investment periodically reallocated along the horizon. It is crucial to ponder the investment strategy coherently with a risk measure, which captures the investor's needs to reduce the chance of losses, and the natural request of the Pension Fund to hedge against the risk of unbalances between the asset and the liability sides. The objective variable will represent the wealth accumulated by the investor in order to match a target wealth that guarantees, at the retirement, an annuity integrating efficiently the public pension annuity, as recently suggested by COVIP. The portfolio allocation must satisfy a set of Value-at-Risk constraints for the investor and for the Pension Fund. The wealth target is tested both in a deterministic and in a stochastic dominance sense with respect to a benchmark portfolio. The model constraints must consider the investor's salary process and his/her saving capacity. A risk coefficient associated to each investment class controls the portfolio exposition in all the stages. The aim of the second step is to define the dynamical optimal strategies for each representative identified in the first step. The obtained here-and-now solutions define the pension plans of the Pension Fund.