

# The Italian Pension Gap: a Stochastic Optimal Control Approach

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## Abstract

*Dini reform* in 1995 deeply changed the Italian pension system. In particular, the public pension provided pre-reform was simply the 2% of the product between total working years and the last salary of the worker. Post-reform several parameters, for instance the real mean GDP increase, were introduced into the formula for the calculation of the pension. Due to the dependence on these parameters, the amount of pension became more uncertain and difficult to predict. Since several recent simulations highlighted that the level of the public pension provided to the generation of young workers might be very low, the pension system is still a highly discussed matter.

For these reasons, we started wondering how to deal with such a problematic issue. Inspired by Vigna and Haberman (2001) [?], and Gerrard, Haberman and Vigna (2004) [?], we thought about investing optimally in a DC pension fund in order to fill the gap created by the difference between the pre-reform pension and the post-reform pension. Therefore, we built a model where the pension fund member invests in a financial market to fill this pension gap by solving a stochastic optimal control problem with suitable annual targets. After finding the closed-form solutions of the problem, we tested the model through several simulations in different reasonable scenarios. Once again, the results highlight a dramatic situation that has to be seriously taken into consideration and may concern other similar pension systems.

**Keywords:** Stochastic optimal control, Dynamic programming, Bellman’s principle of optimality, Pension funds.

## References

- [1] E. Vigna and S. Haberman (2001), “Optimal investment strategy for defined contribution pension schemes.” *Insurance: Mathematics and Economics*, vol. **28**, pp. 233-262.
- [2] R. Gerrard, S. Haberman and E. Vigna (2004). “Optimal investment choices post-retirement in a defined contribution pension scheme.” *Insurance: Mathematics and Economics*, vol. **35**, pp. 321-342.

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