AN OPTIMAL DYNAMIC FUNDING SOLUTION TO PREVENT DEFAULT COSTS

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There are many situations where either public or private resources might be used to obtain social rewards. How to manage those resources in an optimal manner is a problem widely analysed in the literature. Depending on the available controls, and on the social reward that is wanted to be maximized, different optimal control models have been presented. For instance, Arrow (1970) develops models where control instruments such as income tax rate, government deficit size, and debt-money ratio are controlled in order to maximize functions defined in terms of some social criteria (usually depending on growth rate).

In the last years, and more intensely due to economical and financial situation, the institutions have been facing a new resource allocation problem, which is to minimize the social cost incurred by the economy when a company defaults. In other words, if there is a measure of the social and/or economic interest for a firm to survive (e.g. sudden increase in unemployment due to collective redundancies), it is interesting for governments and institutions to have tools to make funding decisions considering the dynamics of the firms.

However, to the best of our knowledge, there is no literature describing dynamic mathematical models for this resource allocation problem. This paper represents a first attempt to develop a mathematical method that provides an optimal resource allocation policy, with the goal of minimizing the lomg term social costs incurred by the economy due to default events.

We consider a resource allocation problem, where some institution decides how to share fixed resources to prevent default events among companies. Under a dynamic approach, the problem is solved in the framework of Multi Armed Restless Bandit problems.

A two-state Markovian process determines the evolution of the default risk, and the objective for the institution is to minimize the total cost incurred in the long term due to default events. We prove the existence of an optimal policy, that assigns an index value to each company identifying its priority for resources. The analytical expression for the index is derived, which generalizes the return-on-investment (ROI) index. Finally, a discussion and intepretation of the structure of the optimal policy is presented and some proposals for future research.

Main Bibliografy

Arrow, Kurz, 1970. Public Investment, The Rate of Return, and Optimal Fiscal Policy. Johns Hopkins University Press.

Gittins, J.C., Glazebrook, K., Weber, R., 2011. Multi-Armed Bandit Allocation Indices. Wiley-Blackwell

Nino-Mora, J., 2007. Dynamic priority allocation via restless bandi marginal productivity indices. TOP 15, 161-198.