



# The value of a liability cash flow in discrete time subject to capital requirements

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## Abstract

The aim of this paper is to define the market-consistent value of a liability cash flow in discrete time subject to repeated capital requirements, and explore its properties. Our multi-period market-consistent valuation approach is based on defining a criterion for selecting a static replicating portfolio and defining the value of the residual liability, whose cash flow is the difference between the original liability cash flow and that of the replicating portfolio. The value of the residual cash flow is obtained as a solution to a backward recursion that is implied by the procedure for financing the repeated capital requirements, and no-arbitrage arguments. We show that the liability value resulting from no-arbitrage pricing of the dividends to capital providers may be expressed as a multi-period cost-of-capital valuation. Explicit valuation formulas are obtained under Gaussian model assumptions.

## 1 Introduction

The aim of this paper is to define the market-consistent value of a liability cash flow in discrete time subject to repeated capital requirements, and explore its properties. The liability should be interpreted as the aggregate liability of a company, i.e. at the level on which capital requirements are imposed. Our multi-period valuation approach is based on defining a criterion for selecting a static replicating portfolio and defining the value of the residual liability whose cash flow is the difference between the original liability cash flow and that of the replicating portfolio. For defining the value of the residual cash flow we do not impose a particular valuation functional. Instead we derive the value as a solution to a backward recursion that is implied by the procedure for financing the repeated capital requirements, and no-arbitrage arguments.

The approach to market-consistent liability valuation presented in [11] has been the main source of inspiration for the current paper. Similarly to what is advocated in [11], and as is explicitly stated in current insurance market regulation, we consider a hypothetical transfer of the liability to a