

# The Market Value Margin with a finite horizon

Aïcha Martijn  
Internship Project

Supervisors:  
Maarten van Wieren (AEGON) PhD  
René Bekker (VU University) PhD

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VU University  
Faculty of Exact Sciences  
Business Mathematics and Informatics  
De Boelelaan 1081a  
1081 HV Amsterdam



AEGON Netherlands  
AEGONplein 50  
2591 TV The Hague  
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## Preface

To graduate for the master Business Mathematics and Informatics at the VU University in Amsterdam, one has to fulfill a six-month internship. My internship was done at the Economic Capital Management (ECM) department, a sub-department of the Risk and Capital Management (RCM) department, within AEGON. My internship research was done in the period of July 2008 - January 2009. This report is the final result of my internship.

The experience gained at this department is very valuable. My gratitude goes to the whole RCM team for giving me their support. I especially would like to thank Maarten van Wieren PhD, my supervisor at AEGON for giving me the opportunity to do my internship at the ECM department and also for making himself available when necessary. I admire his patience, diplomacy and multi way of analyzing things. The seed of the exact method on which this research is done originates from him. I also would like to thank my colleague Gerben de Klerk who was my project-partner over the last 3 month of my internship. He was of much help.

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# 1 Introduction

This internship report is for the Risk and Capital Management department within AEGON. The main focus of this internship project is to look for an exact calculation of the Market Value Margin (MVM) for non-hedgeable risk and to compare this with the current model.

The Risk and Capital Management (RCM) department at AEGON is a relatively new department and is responsible for the quantification of financial risk. The sub-department Economic Capital Management (ECM) is responsible for the calculation of the Economic Capital Model through cash-flow models. The Market Value Margin (MVM) is the cost for holding the current and future amount of the Economic Required Capital (ERC).

## 1.1 Scope of report

The purpose of this document is to give an exact calculation for the MVM and then to compare the results with the results of the current model. The current model is called the Prospective Method approximated ( $PM_{approx}$ ) and is based on two assumptions. The first one is that there is only one shock (disaster) event possible and the second is that the one shock that takes place happens at time zero. The MVM calculation, which is originally recursive, is transformed into a non-recursive and becomes easy to implement when these two assumptions are applied.

The exact and non-recursive formula that is presented in this report for the calculation of the MVM is called the Telescoping Recursion Method (TRM) since it converts a recursive calculation into a non-recursive one. The result is a ratio called the **a-value** is given that represents the difference between the MVM calculated with the TRM and the MVM calculated with the  $PM_{approx}$ . Moreover, the results of this research give an indication on the exactness of the approximation of the  $PM_{approx}$  and also whether AEGON holds more or less capital than is necessary.

## 1.2 Outline of report

Sections 1 and 2 present a global economic background with the purpose to understand the importance of the MVM. The focus of Section 3 is an outline of the difficulties concerning the MVM calculation. It also presents the Prospective Method approximated ( $PM_{approx}$ ) and the Telescoping Recursion Method (TRM). Section 4 presents some details that are necessary to consider prior to the implementation. In Section 5, the two models for the calculation of the MVM are implemented. The results of the implementation are presented in Section 6. This report is concluded with a discussion in Section 7.