



10-1-2013

Recreating Retirement Sustainability

Olivia S. Mitchell

The Wharton School, University of Pennsylvania, mitchelo@wharton.upenn.edu

Raimond Maurer

Goethe University, maurer@finance.uni-frankfurt.de

Follow this and additional works at: https://repository.upenn.edu/prc_papers



Part of the [Economics Commons](#)

Mitchell, Olivia S. and Maurer, Raimond, "Recreating Retirement Sustainability" (2013). *Wharton Pension Research Council Working Papers*. 124.

https://repository.upenn.edu/prc_papers/124

The published version of this Working Paper may be found in the 2014 publication: *Recreating Sustainable Retirement: Resilience, Solvency, and Tail Risk*.

This paper is posted at ScholarlyCommons. https://repository.upenn.edu/prc_papers/124

For more information, please contact repository@pobox.upenn.edu.

Recreating Retirement Sustainability

Abstract

The financial crisis and the ensuing Great Recession have alerted those concerned with old-age security to the extreme risk confronting our retirement system. In this volume, we provide an indepth analysis of the 'black swans' threatening pension plans around the world. Longevity risk, capital market shocks, regulatory and political risk, and model risk all have profound consequences for pension plan participants, plan sponsors, regulators, and consultants. This book also sketches various ways to manage and finance these risks, with a view to rebuilding a more resilient retirement system. In particular, the ensuing chapters take on longevity risk, capital market risk, model risk, and regulatory risk.

Disciplines

Economics

Comments

The published version of this Working Paper may be found in the 2014 publication: *Recreating Sustainable Retirement: Resilience, Solvency, and Tail Risk*.

Recreating Sustainable Retirement

Resilience, Solvency, and Tail Risk

EDITED BY

Olivia S. Mitchell,
Raimond Maurer, and
P. Brett Hammond

OXFORD
UNIVERSITY PRESS

OXFORD

UNIVERSITY PRESS

Great Clarendon Street, Oxford, OX2 6DP,
United Kingdom

Oxford University Press is a department of the University of Oxford.
It furthers the University's objective of excellence in research, scholarship,
and education by publishing worldwide. Oxford is a registered trade mark of
Oxford University Press in the UK and in certain other countries

© Pension Research Council, The Wharton School, University of Pennsylvania 2014

The moral rights of the authors have been asserted

First Edition published in 2014

Impression: 1

All rights reserved. No part of this publication may be reproduced, stored in
a retrieval system, or transmitted, in any form or by any means, without the
prior permission in writing of Oxford University Press, or as expressly permitted
by law, by licence or under terms agreed with the appropriate reprographics
rights organization. Enquiries concerning reproduction outside the scope of the
above should be sent to the Rights Department, Oxford University Press, at the
address above

You must not circulate this work in any other form
and you must impose this same condition on any acquirer

Published in the United States of America by Oxford University Press
198 Madison Avenue, New York, NY 10016, United States of America

British Library Cataloguing in Publication Data

Data available

Library of Congress Control Number: 2014940448

ISBN 978-0-19-871924-3

Printed and bound by
CPI Group (UK) Ltd, Croydon, CR0 4YY

Links to third party websites are provided by Oxford in good faith and
for information only. Oxford disclaims any responsibility for the materials
contained in any third party website referenced in this work.

Contents

<i>List of Figures</i>	ix
<i>List of Tables</i>	xiii
<i>Notes on Contributors</i>	xv

1. Recreating Retirement Sustainability <i>Olivia S. Mitchell and Raimond Maurer</i>	1
---	---

Part I. Capital Market and Model Risk

2. Managing Capital Market Risk for Retirement <i>Enrico Biffis and Robert Kosowski</i>	9
3. Implications for Long-term Investors of the Shifting Distribution of Capital Market Returns <i>James Moore and Niels Pedersen</i>	30
4. Stress Testing Monte Carlo Assumptions <i>Marlena I. Lee</i>	60

Part II. Longevity Risk

5. Modeling and Management of Longevity Risk <i>Andrew Cairns</i>	71
6. Longevity Risk Management, Corporate Finance, and Sustainable Pensions <i>Guy Coughlan</i>	89
7. Model Risk, Mortality Heterogeneity, and Implications for Solvency and Tail Risk <i>Michael Sherris and Qiming Zhou</i>	113
8. The Securitization of Longevity Risk and Its Implications for Retirement Security <i>Richard MacMinn, Patrick Brockett, Jennifer Wang, Yijia Lin, and Ruilin Tian</i>	134

viii Contents

Part III. Regulatory and Political Risk

9. Evolving Roles for Pension Regulations: Toward Better Risk Control? 163
E. Philip Davis
10. Developments in European Pension Regulation: Risks and Challenges 186
Stefan Lundbergh, Ruben Laros, and Laura Rebel
11. Extreme Risks and the Retirement Anomaly 215
Tim Hodgson

Part IV. Implications for Plan Sponsors

12. Risk Budgeting and Longevity Insurance: Strategies for Sustainable
Defined Benefit Pension Funds 247
Amy Kessler
13. The Funding Debate: Optimizing Pension Risk within a Corporate
Risk Budget 273
Geoff Bauer, Gordon Fletcher, Julien Halfon, and Stacy Scapino
- The Pension Research Council* 293
- Index* 297

Chapter 1

Recreating Retirement Sustainability

Olivia S. Mitchell and Raimond Maurer

The financial crisis and the ensuing Great Recession alerted all those working to ensure old-age security about the extreme risks confronting the financial and political institutions comprising our retirement system. This volume offers an in-depth analysis of the recently glimpsed ‘black swans’ that threaten private and public pensions around the world. Capital market shocks, surprises to longevity, regulatory and political risk, and errors in modeling all have profound consequences for stakeholders ranging from pension plan participants and plan sponsors to policymakers and those who seek to make retirement more resistant. In this book we analyze such challenges to retirement sustainability, and explore ways to better manage and finance them, as well. This understanding is intended to help rebuild retirement systems capable of withstanding what the future will bring.

Modeling and Managing Capital Market Risk

One way that pension plans can better handle the capital market risks they inevitably confront is to undertake liability-driven investment (LDI). In their chapter, Enrico Biffis and Robert Kosowski outline the main principles behind this variant of asset liability management (ALM) and describe commonly used hedging tools. They also discuss emerging de-risking tools such as pension buyouts/ins, longevity swaps, and tail risk hedges that have gained popularity in light of the rise in cross-asset correlation associated with quantitative easing. The main challenges ahead they identify include changes in pension regulation, centralized clearing of derivatives, and risk-taking incentives in delegated asset management for pension plans. Recent innovations include risk on/off trading, stock-bond correlation longevity swaps, and Credit Support Annex (CSA) pricing. Non-cleared derivatives may also be part of the solution.

A different concern arises from the fact that projections 30 years out may be problematic when asset returns are not well-behaved. James Moore and Niels Pederson’s chapter proposes that historical data suggest important deviations from normality in asset returns, so that fat tails and extreme events happen more often than we once anticipated. Their preferred approach to simulation therefore involves developing a macroeconomy-consistent structural model, which can be

2 Recreating Sustainable Retirement

used to run simulations through real-world simulators. They devise and implement a regime-switching model with these features, and then they compare results to those obtained using more conventional approaches.

In her chapter, Marlena Lee brings her own measured perspective to the way in which many pension modelers use stochastic models to project the future. Monte Carlo simulation is commonly used in risk analysis and in financial planning, which generally assumes normal distributions of uncertainty. While such simulations will always be a useful financial planning tool, she also highlights their limitations. Specifically, she notes that returns of 40 percent would be anticipated to occur only once each 520 years if shocks were normally distributed, but these were seen in both 1931 and 2008. Moreover, returns in excess of 70 percent would be expected to occur only every 4002 years, but this happened in 1933.

In sum, experts agree that all statistical models can provide useful guides, but model risk remains a crucial problem that cannot be taken too lightly. Financial models played a key role in the global financial crisis, and new ways of modeling financial risk are greatly needed.

Measuring and Managing Longevity Risk

As the workforce ages and people live longer, analysts concerned with retirement security have focused increasingly on how financial markets can be constructed to help model and manage longevity risk. Andrew Cairns' chapter notes that many statistical models of the human life extension are not very robust, though good models are critical if we are to properly forecast future mortality patterns and protect retirement plans against this risk. Defined benefit (DB) plans in particular need ways to hedge against large increases in human survival rates, including longevity swaps. Nevertheless, pension plan sponsors must also evaluate their appetite for and tolerance to risk, in order to determine how much to pay for such protection. This is not always an easy task.

Taking the argument a step further, in his chapter Guy Coughlan proposes that DB pension plans should address longevity risk in the larger framework of corporate finance and financial economics. He points out that with the development of longevity swaps, this risk can now be hedged in a flexible and customized way. As a result, DB pension plans now have at their disposal a complete toolkit for ensuring they are managed in a sustainable fashion. In fact, because of the compounding effects between longevity and interest rate risks, he suggests that it is financially desirable to manage these two liability risks in concert. His proposed framework provides the basis for addressing key pension risk management decisions, including whether to consider a buyout/termination or pursue the hedging of longevity risk as part of the long-term management of the plan. He then shows how this approach helps understand the different ways in which Ford, General Motors, and Verizon handled risk management in their pensions.

The chapter by Michael Sherris and Qiming Zhou outlines several different actuarial approaches to modeling longevity risk. As they point out, systematic mortality risk models and Markov aging models that can handle heterogeneity have been developed, yet analysts often capture only one of these aspects of mortality risk. Their work, by contrast, includes both a mortality heterogeneity model and a frailty model, to show the impact of this risk on annuity fund values at older ages. In particular, when a mortality model includes systematic risk, this can increase the tail of the mortality distribution. They also allow for adverse selection to impact pension plan fund values.

Securitization of longevity risk is a topic that has generated much interest of late, as noted in the chapter by Richard MacMinn, Patrick Brockett, Jennifer Wang, Yijia Lin, and Ruilin Tian. These authors explore several ways to manage longevity risk in both DB and defined contribution (DC) plans, noting that longevity risk is a \$2.2 trillion business in the U.S. and a \$42 trillion business globally.

Preparing for Regulatory and Political Risk

No expert in the retirement security arena can ignore what many in the field call regulatory and political risk. This topic is the purview of Philip Davis, whose chapter focuses on how pension regulation has become more focused on risk, transparency, and governance. In fact, he points out that some regulatory developments have been counterproductive, inducing pension funds to become increasingly short-term focused in their investments. Whereas banks have been subjected to new regulation under the Basel III international agreements in the wake of the financial crisis, Davis contends that pension funds do not compete across borders, a pension failure does not usually produce significant externalities across borders, and pension policy remains national in scope. Nevertheless, he also recognizes that some global similarity in regulation of company funds would likely be beneficial to multinationals. Some countries have turned to a focus on risk-based supervision for DC pensions. Additionally, international accounting standards are a form of regulation, in particular the mark-to-market movement.

The chapter by Stefan Lundbergh, Ruben Laros, and Laura Rebel examines how regulation can replicate what traditional DB pension schemes offered: they completed the market by offering real deferred annuities to their members. Although the traditional DB design proved to be unsustainable due to the demographic developments, it still serves as a guide of what good pension solutions should provide, namely a lifelong stable inflation and linked cash flows at retirement. And in this context, they argue that risk should be defined as the probability of failing to provide stable retirement income. This approach to pension risk differs substantially from the wealth management portfolio approach. Against this backdrop, they see recent European Union (E.U.) regulatory changes as seeking to create a single market among member states for retirement provision and thus

4 Recreating Sustainable Retirement

to remove an obstacle to labor mobility. In turn, this effort to bring coherence will increase transparency and create incentives for insurance companies and pension funds to manage the balance sheet risks in an economically meaningful way, while also providing regulators with an early warning system and tools for intervention. The authors also suggest that by applying the principles of market consistent valuation and pricing mechanisms to pension design, it will be possible to build a collective product that is fair to the members/customers and embodies an internally consistent risk-based framework.

In his chapter, Tim Hodgson points out that we cannot diversify our risk across time; hence he contends that analysts, regulators, and plan designers should give greater weight to the consequences of outcomes and less weight to their likelihoods. And in this context, extreme risks matter and deserve more attention than they have been given thus far. This is particularly worrisome since the global economic environment continues to be characterized by significant imbalances, and retirement for the masses is at serious risk. In fact he believes that retirement as currently configured was never affordable, but this reality was hidden by demographic and debt trends over many decades. He adds that a ranking system is a useful way to prioritize efforts to consider and manage potential risk exposures; as far as hedging is concerned, the major conclusion is that political, environmental, social, and technological risks are generally difficult to hedge. In view of this, a pragmatic solution is less about changing investment strategy and more about building a larger risk buffer.

Implications for Plan Sponsors

While population aging continues unabated, Amy Kessler notes in her chapter that the low growth/low interest rate environment is producing a deep funding gap for plan sponsors, who have been taking on more risk to bridge the gap. In fact, she questions whether there is any way to budget and moderate risk, provide for increasing longevity, manage the intergenerational risk in the pension plan, and create greater certainty that participant pension benefits can be met. One solution might be to increase retirement ages. Also, pension risk-transfer decisions made without taking longevity risk into account will consistently undervalue benefits of risk management. By contrast, she contends that a sustainability model will need to depart from the conventional approach, by building in a risk budget.

The study by Geoff Bauer, Gordon Fletcher, Julien Halfon, and Stacy Scapino argues that corporations have allocated a significant share of available cash originating from ongoing operations, as well as equity and debt, to finance pension obligations rather than to boost core productive activities or enhance shareholder value. And firms sponsoring under- or unfunded pension liabilities should assess whether they must provide additional voluntary funding, invest in alternative opportunities, or pursue other corporate activities. In their view, a holistic

approach to pension risk and funding can prevent another decade of weak asset liability management strategies, conflicts with trustees, investment boards and unions, and lost pension contributions. Pension deficits ballooned after the 2008 crisis, and corporate finance decisions must be balanced in the face of pension risk and governance.

Conclusion

Many see the lengthening human life span as a welcome development. Nevertheless, longer time horizons also expose us to greater risk and reduce our ability to predict long-term returns. Moreover, managers of retirement systems grounded on social security and medical care benefit promises now fear that the latter face insolvency. For all these reasons, pensions will need to be reimaged if they are to survive in the face of demographic, capital market, model, and regulatory risk. In the United States and many other countries, an additional challenge arises from the fact that pensions had initially been designed to be an employer responsibility. But as the twenty-first century progresses, employer commitment to traditional benefit systems appears to be on the downturn. Inevitably, these trends highlight a profound need to reimagine pensions and other retirement benefits. This volume offers ideas and suggestions toward that end.

References

- Bauer, G., G. Fletcher, J. Halfon, and S. Scapino (2014). 'The Funding Debate: Optimizing Pension Risk within a Corporate Risk Budget,' in P. B. Hammond, R. Maurer, and O. S. Mitchell, eds., *Recreating Sustainable Retirement: Resilience, Solvency, and Tail Risk*. Oxford, U.K.: Oxford University Press, pp. 273–292.
- Biffis, E. and R. Kosowski (2014). 'Managing Capital Market Risk for Retirement,' in P. B. Hammond, R. Maurer, and O. S. Mitchell, eds., *Recreating Sustainable Retirement: Resilience, Solvency, and Tail Risk*. Oxford, U.K.: Oxford University Press, pp. 9–29.
- Cairns, A. (2014). 'Modeling and Management of Longevity Risk,' in P. B. Hammond, R. Maurer, and O. S. Mitchell, eds., *Recreating Sustainable Retirement: Resilience, Solvency, and Tail Risk*. Oxford, U.K.: Oxford University Press, pp. 71–88.
- Coughlan, G. (2014). 'Longevity Risk Management, Corporate Finance, and Sustainable Pensions,' in P. B. Hammond, R. Maurer, and O. S. Mitchell, eds., *Recreating Sustainable Retirement: Resilience, Solvency, and Tail Risk*. Oxford, U.K.: Oxford University Press, pp. 89–112.
- Davis, E. P. (2014). 'Evolving Roles for Pension Regulations: Toward Better Risk Control?' in P. B. Hammond, R. Maurer, and O. S. Mitchell, eds., *Recreating Sustainable*

6 Recreating Sustainable Retirement

- Retirement: Resilience, Solvency, and Tail Risk*. Oxford, U.K.: Oxford University Press, pp. 163–185.
- Hodgson, T. (2014). ‘Extreme Risks and the Retirement Anomaly,’ in P. B. Hammond, R. Maurer, and O. S. Mitchell, eds., *Recreating Sustainable Retirement: Resilience, Solvency, and Tail Risk*. Oxford, U.K.: Oxford University Press, pp. 215–243.
- Kessler, A. R. (2014). ‘Risk Budgeting and Longevity Insurance: Strategies for Sustainable Defined Benefit Pension Funds,’ in P. B. Hammond, R. Maurer, and O. S. Mitchell, eds., *Recreating Sustainable Retirement: Resilience, Solvency, and Tail Risk*. Oxford, U.K.: Oxford University Press, pp. 247–272.
- Lee, M. (2014). ‘Stress Testing Monte Carlo Assumptions,’ in P. B. Hammond, R. Maurer, and O. S. Mitchell, eds., *Recreating Sustainable Retirement: Resilience, Solvency, and Tail Risk*. Oxford, U.K.: Oxford University Press, pp. 60–67.
- Lundbergh, S., R. Laros, and L. Rebel (2014). ‘Developments in European Pension Regulation: Risks and Challenges,’ in P. B. Hammond, R. Maurer, and O. S. Mitchell, eds., *Recreating Sustainable Retirement: Resilience, Solvency, and Tail Risk*. Oxford, U.K.: Oxford University Press, pp. 186–214.
- MacMinn, R., P. Brockett, J. Wang, Y. Lin, and R. Tian (2014). ‘The Securitization of Longevity Risk and Its Implications for Retirement Security,’ in P. B. Hammond, R. Maurer, and O. S. Mitchell, eds., *Recreating Sustainable Retirement: Resilience, Solvency, and Tail Risk*. Oxford, U.K.: Oxford University Press, pp. 134–160.
- Moore, J., and N. K. Pederson (2014). ‘Implications for Long-term Investors of the Shifting Distribution of Capital Market Returns,’ in P. B. Hammond, R. Maurer, and O. S. Mitchell, eds., *Recreating Sustainable Retirement: Resilience, Solvency, and Tail Risk*. Oxford, U.K.: Oxford University Press, pp. 30–59.
- Sherris, M. and Q. Zhou (2014). ‘Model Risk, Mortality Heterogeneity, and Implications for Solvency and Tail Risk,’ in P. B. Hammond, R. Maurer, and O. S. Mitchell, eds., *Recreating Sustainable Retirement: Resilience, Solvency, and Tail Risk*. Oxford, U.K.: Oxford University Press, pp. 113–133.