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Optimal consumption–portfolio choices and retirement planning

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Abstract

We examine consumption and investment decisions in a life-cycle model with habit formation, stochastic opportunity set, stochastic wages and labor supply flexibility. Retirement is taken into account by specifying an age at which labor earnings stop, but consumption spending continues. Explicit solutions are obtained for optimal consumption, labor supply and the financing portfolio. We examine the structure and determinants of the optimal portfolio. We also study the effects of the retirement date and of habits on optimal decisions. Finally, we conduct a preliminary analysis to assess the effects of a liquidity constraint on optimal consumption–leisure choices. © 2003 Elsevier B.V. All rights reserved.

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1. Introduction

Quantitative models for retirement planning have, in recent years, become the subject of intense practical interest. The reason is the rapid growth of self-directed retirement accounts, such as 401k, 403b, IRA, Keogh, etc. A defining feature of these accounts

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is that people must decide how much to contribute and how to allocate their accumulations among the choices offered. Investment advisory services have responded by providing interactive retirement planning “tools” which embody quantitative models for computing desired savings and optimal asset allocations. At the core of these planning tools is the single-period mean–variance portfolio selection model developed by Markowitz (1952).¹ Because this model ignores so many factors that are relevant to real-world investment decisions, critics have questioned the usefulness of planning calculators.² Fortunately, over the past three decades, scholars in economics and finance have produced lifetime optimization models that capture many of the important features of reality, such as differing time horizons, family status, human-capital endowments, and habit formation. This paper builds on these contributions by suggesting further aspects that would improve the quantitative models that should be used in retirement planning.

For this purpose we study consumption, labor/leisure and portfolio choices in a life-cycle model with labor income flexibility and habit formation. Our contribution can best be understood relative to Bodie et al. (BMS) (1992) who were first to endogenize the labor/leisure decision in an intertemporal consumption–portfolio choice model à la Samuelson (1969) and Merton (1969, 1971). BMS demonstrated that human capital has a critical impact on optimal policies. Among other items they showed (a) that investment behavior, typically, becomes more conservative as retirement approaches, (b) that labor flexibility smooths consumption behavior and (c) that it promotes greater risk-taking in financial investments.

This paper extends their analysis by incorporating (i) habit formation, (ii) two distinct periods during the life-cycle, i.e. an accumulation period and a retirement period and (iii) a more general financial market with multiple assets and stochastic coefficients.³ It also presents a preliminary analysis of the impact of a liquidity constraint. In this context we provide explicit solutions for, or detailed characterizations of, the optimal policies. One of our contributions is to derive the optimal portfolio in closed form. Another one is to show how properties of the optimal policies, such as (a)–(c), are amended in this general setting.

Kenc (1999) also extends the ideas of BMS by including (i) freedom to retire, (ii) variations in labor productivity over the life-cycle and (iii) nontradedness of human capital and liquidity constraints. Each of these aspects, however, is considered in isolation.⁴ Moreover, his analysis assumes a constant opportunity set and focuses on time separable preferences with Cobb–Douglas utility. Our model gives results for more general preferences, a stochastic opportunity set and a wage rate process with

¹ This seems to be true even for the most sophisticated calculators, such as financialengines.com and [mPower](http://mPower.com).

² See “Bells, Whistles and Optimizers: Is successful asset allocation art or science?” <http://money.cnn.com/pf/101/lessons/15/page3.html>.

³ Merton (1983) also discusses life-cycle choices in the presence of an accumulation and a retirement period. Although Merton’s individual would like to keep her “standard of living” her preferences do not incorporate habit formation. She also does not have the flexibility of choosing the number of hours of work.

⁴ Thus, Kenc (1999) summarizes results provided in Sundaresan and Zapatero (1997) who deal with (i) and (ii) and Koo (1998), He and Pages (1993) and El Karoui and Jeanblanc-Picque (1998) who cover (iii).

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