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Journal of Monetary Economics 52 (2005) 951–969
Journal of MONETARY ECONOMICS
www.elsevier.com/locate/jme

Estimating the expected marginal rate of substitution: A systematic exploitation of idiosyncratic risk ☆

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Available online 29 August 2005

Abstract

We develop a methodology to estimate the shadow risk free rate or expected intertemporal marginal rate of substitution, "EMRS". Our technique relies upon exploiting idiosyncratic risk, since theory dictates that idiosyncratic shocks earn the EMRS. We apply our methodology to recent monthly and daily data sets for the New York and Toronto Stock Exchanges. We estimate EMRS with precision and considerable time-series volatility, subject to an identification assumption. Both markets seem to be internally integrated; different assets

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doi:10.1016/j.jmoneco.2005.07.008

traded on a given market share the same EMRS. We reject integration between the stock markets, and between stock and money markets.

JEL Classification: G14

Keywords: Integration; Asset; Market; Discount; Stock

1. Introduction

In this paper, we develop and apply a simple methodology to estimate the shadow risk-free rate or expected intertemporal marginal rate of substitution (hereafter "EMRS"). We do this for two reasons. First, it is of intrinsic interest. Second, when different series for the EMRS are estimated for different markets, comparing these estimates provides a natural test for integration between markets. Our method is novel in that it exploits information in asset-idiosyncratic shocks.

While the primary objective of this paper is methodological, we illustrate our technique by applying it to monthly and daily data covering firms from large American and Canadian stock exchanges. Our method delivers EMRS estimates with precision and striking volatility. Estimates from different markets can be distinguished from each other and from the Treasury bill equivalent.

Section 2 motivates our measurement by providing a number of macroeconomic applications. We then present our methodology; implementation details are discussed in the following section. Our empirical results are presented in Section 5, while the paper ends with a brief conclusion.

2. Why should macroeconomists care about asset market integration?

We begin with a conventional intertemporal asset pricing condition:

$$p_t^j = E_t(m_{t+1}x_{t+1}^j), \tag{1}$$

where p_t^j is the price at time t of asset j, $E_t()$ is the expectations operator conditional on information available at t, m_{t+1} is the time-varying intertemporal marginal rate of substitution (MRS), used to discount income accruing in period $t+1$ (also known as the stochastic discount factor, marginal utility growth, or pricing kernel), and x_{t+1}^j is income received at $t+1$ by owners of asset j at time t (the future value of the asset plus any dividends or other income).

We adopt the standard definition of asset integration—*two assets are said to be integrated when the systemic and idiosyncratic risks in those assets are priced identically*. Here "priced" means that Eq. (1) holds for the assets in question. Eq. (1) involves the moments of m_{t+1} and x_{t+1}^j, not the realized values of those variables. Although many moments of m_{t+1} are involved in asset market integration, the object of interest to us in this study is $E_t m_{t+1}$ the time t expectation of the intertemporal