ELSEVIER

Journal of Economic Behavior & Organization
Vol. 65 (2008) 585–591

JOURNAL OF
Economic Behavior
& Organization

www.elsevier.com/locate/econbase

Risk-aversion and the investment–uncertainty relationship: The role of capital depreciation

Gianluca Femminis*

Department of Economics, Università Cattolica del S.Cuore, Largo Gemelli 1, I-20123, Milano, Italy

Received 9 March 2005; received in revised form 14 December 2005; accepted 20 March 2006
Available online 30 October 2006

Abstract

Some recent contributions [Nakamura, T., 1999. Risk-aversion and the uncertainty–investment relationship: a note. Journal of Economic Behavior and Organization 38, 357–363; Saltari, E., Ticchi, D., 2005. Risk-aversion and the investment–uncertainty relationship: a comment. Journal of Economic Behavior and Organization 56, 121–125] suggest that investments react negatively to uncertainty when the risk aversion index characterizing firm's preferences is lower than one but higher than the labour income share of output. We show that this result crucially depends on the assumption of complete capital depreciation after production. When realistic values for the capital depreciation parameter are taken into account, the investment–uncertainty relation is negative for values of the risk-aversion index larger than unity.

JEL classification: D81; D89; E22

Keywords: Investment; Uncertainty; Risk aversion; Capital depreciation

In a recent contribution, Saltari and Ticchi (2005) assess the effects of an increase in price uncertainty on investment in a model where competitive firms evaluate the stream of future cash-flows according to constant relative risk aversion intertemporal preferences. They show that the relation between price uncertainty and investment is negative when the risk aversion index is lower than one but higher than the labour income share of output. While the idea of analyzing the relation between investment and uncertainty in a dynamic framework with risk-averse firms is interesting, this result is unappealing. In fact, while the empirical evidence is in favor of a negative

* Tel.: +39 02 72343808; fax: +39 02 72342923.
E-mail address: gianluca.femminis@unicatt.it (G. Femminis).

0167-2681/$ – see front matter © 2006 Elsevier B.V. All rights reserved.
doi:10.1016/j.jebo.2006.03.003

relationship between investment and uncertainty, several studies have concluded that the degree of risk aversion is higher than unity.[1]

In this paper, we show that the result underscored by Saltari and Ticchi crucially depends on the assumption of complete capital depreciation after production. When realistic values for the capital depreciation parameter are taken into account, the investment–uncertainty relation is negative for values of the risk-aversion index larger than unity.

To understand this result, we analyze in detail the effects of an increase in uncertainty on the decisions of an intertemporally optimizing firm. We underscore that an increase in the price variance involves a risk aversion effect, which exerts a negative influence on investment if (and only if) the risk-aversion index is smaller than unity; otherwise a "precautionary" increase in investment is induced.

However, a second effect is at work. The convexity in the firm's profit function implies that a mean-preserving spread in the output price brings about an expansion in the expected rate-of-return, which involves an "income effect", playing in favor of a reduction in savings. However, because investments become more productive, the increase in the expected return on capital also works in favor of their increase. It turns out that the negative effect of the price variance on savings is stronger than the positive one for a risk aversion index higher than one.

We show that the lower the depreciation parameter, the milder is the risk-aversion effect. Hence, a reduction of the depreciation parameter gives more prominence to the effects induced by the increase in the rate of return, which acts in favor of a negative investment–uncertainty relationship with values of the risk aversion index higher than one.

1. The analytical framework

We assume that the technology of the competitive firms is a constant returns to scale Cobb Douglas, $Y_t = K_t^{1-\alpha} L_t^{\alpha}$, where K_t is the stock of capital at time t and L_t is the labour employed. Notice that α is labour's share of output. Following Nakamura and Saltari and Ticchi, we assume that the output price, p_t, is stochastic; more specifically, for us p_t is a serially independent random variable with mean $\bar{p}$ and variance σ^2. The firm's cash flow at time t is given by

$$\pi_t = p_t K_t^{1-\alpha} L_t^{\alpha} - wL_t - I_t,$$

where w is the constant nominal wage.[2] As in many classic papers (see, e.g., Hartman, 1972; Abel, 1983), the firm first decides upon the capital level, then observes the realization of the price shock and finally it chooses the optimal amount of labour, which is $\hat{L}_t = [(\alpha/w)p_t]^{\eta} K_t$, where $\eta \equiv 1/(1-\alpha)$. Bear in mind that $\eta > 1$, since $\alpha \in (0, 1)$. Having set $L_t = \hat{L}_t$, the firm's cash flow becomes

$$\hat{\pi}_t = B_t^{\eta} K_t - I_t, \tag{1}$$

where $B_t = Bp_t$ and $B = (1-\alpha)^{1-\alpha}(\alpha/w)^{\alpha}$. $B_t^{\eta} K_t$ represents the operating profits; in what follows we will refer to B_t^{η} as the marginal revenue product of capital. Following again Nakamura

[1] Weil (1989) suggests that the degree of relative risk aversion is in the range between one and five. Epstein and Zin (1991) cannot reject the null hypothesis of a degree of risk aversion as low as one, but recent investigations typically find values higher than unity. For example, Normandin and St-Amour (1998) find values between 1.42 and 3.14; Bliss and Panigirtzoglou (2004), estimate the relative risk aversion index for investors in options based on the FTSE 100 and the S&P 500 indexes. They find that the RRA index is, respectively, 1.97 and 3.37 (when the forecast horizon is 6 weeks long).

[2] The price of capital has been normalized to unity, with no loss of generality.