

# Market-Consistent Valuation and Financial Management of an Insurance Firm \*

PABLO KOCH-MEDINA<sup>1,2</sup>, SANTIAGO MORENO-BROMBERG<sup>1</sup>, CLAUDIA RAVANELLI<sup>1</sup>, AND MARIO ŠIKIĆ<sup>1</sup>

<sup>1</sup>*Center for Finance and Insurance (UZH), Andreasstrasse 15, CH-8050 Zurich, Switzerland.*

<sup>2</sup>*Swiss Finance Institute*

## Extended abstract

We understand the financial management of an insurance firm to be the specification of its *capital policy* (how much dividends to pay and how much capital to raise) and of its *investment policy* (how much investment risk<sup>1</sup> to take). Whether or not insurance firms should take investment risk at all remains to date an elusive question and is still the subject of controversy both amongst academics and practitioners. The main objective of this article is to develop a rigorous, discrete-time, dynamic framework so as to address the financial management questions raised above and, in particular, to contribute to an understanding of whether taking liquid investment risk is justified.

We consider a limited-liability insurance firm with a diffuse shareholder base. Since shareholders can hedge liquid investment risk and diversify idiosyncratic risk, the firm's manager is assumed to behave in a risk neutral way and to focus on value maximization, e.g. Jensen (2002), defined as the net present value of the cash flows shareholders receive up to the firm's liquidation. The manager must acknowledge financial market prices, which leads to what we call a *market-consistent* valuation, and his risk neutrality only affects the value of the idiosyncratic component of cash flows. Our first contribution is to establish the existence of a unique valuation rule, expressed in terms of a *valuation measure*, that exhibits this property.

Each possible choice of capital and investment policies for the firm gives rise to a particular stream of cash flows to shareholders obtained by netting, at each date, dividend payments and capital injections. The manager's task is to select an *optimal* policy, i.e one whose corresponding cash flows have maximal value. This is precisely the *firm's value*. Given that we allow for capital raising, at each date the random cash flow to shareholders may take positive and negative values. As a result, the value of these cash flows may not be defined without them satisfying certain technical conditions. Our second contribution is to show, using purely economic arguments, that the manager may legitimately restrict his attention to a class of policies that do admit a well-defined value rather than imposing ad-hoc restrictions on the set of admissible policies.

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Corresponding author: Pablo Koch-Medina. E-mail address: pablo.koch@bf.uzh.ch

<sup>1</sup>In this paper we focus exclusively on liquid investment risk.

The third contribution of our paper is to provide insights into the optimal capital and investment policies of an insurance firm. To add greater realism to our model, we allow for several well-documented frictions typical for the environment insurance companies operate in; see for instance Froot (2007). First, there are deadweight costs associated with holding capital within the firm. These may include double-taxation, agency, and financial distress costs. Second, raising new capital involves a cost, which we assume to be fixed. Finally, there are minimum (equity) capital requirements that the firm must satisfy in order to operate. Employing dynamic-programming techniques in the spirit of Gerber et al. (2010), we establish the existence of deterministic, stationary optimal capital and investment policies. As a result, firm value is given by a *value function* depending exclusively on the current level of equity capital.

*Keywords:* Insurance companies; default option; franchise value; dividend payments; investment strategy; market-consistent valuation.

*JEL classification:* G21; G28; G32; G35.

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