46th Annual Iranian Mathematics Conference
25-28 August 2015
Yazd University
Talk

pp.: 1–3

Risk measure in a financial market

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Abstract

In this paper we extend the definition of risk measure from L^∞ to an arbitrary Polish space with special conditions. For this purpose we present a measure preserving transformation between two Polish spaces with special conditions.

Keywords: Polish space, Risk measure, Risk management, Transformation
Mathematics Subject Classification [2010]: 60Hxx, 60Bxx, 60Gxx

1 Introduction

Risk management is a very important concept in financial mathematics and specially in a financial market.
For managing risk in a financial market we need to compute risk measure in a financial market which in [1, 2, 4, 5] is defined on $\mathbb{L}^\infty$. In this paper we extend the definition of risk measure from $\mathbb{L}^\infty$ to an arbitrary uncountable Polish space. For this purpose we construct a measure preserving transformation between two Polish spaces which have special conditions.

2 Risk Measure

Risk measure is widely used as instrument to control risk. In fact risk measures assign a real number to a risk in a financial market. As usual in actuarial sciences we assume that X describes a potential loss, but we allow X to assume negative values. Let $(\Omega, \mathscr{F}, P)$ be a probability space and expectation of a random variable X with respect to P is denoted by $E[X]$.

Definition 2.1. [2, 3] Let X be the set of all functions $f : \Omega \to \mathbb{R}$. A mapping $\rho : X \to \mathbb{R}$ is called a risk measure if it has the following conditions.

- Monotonicity: If $X \leq Y$ then $\rho(X) \leq \rho(Y)$;
- Translation invariance: if $m \in \mathbb{R}$, then $\rho(X + m) = \rho(X) + m$;
- Subadditivity: $\rho(X + Y) \leq \rho(X) + \rho(Y)$;
- Positive homogeneity: if $\lambda > 0$, then $\rho(\lambda X) = \lambda\rho(X)$;

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