

Can We Save The Recovery Theorem?

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Ross proposed a remarkable theorem that, under strong market and risk preference assumptions, made it possible to recover the physical probabilities and the pricing kernel simultaneously using only a set of option prices. Since its introduction, a number of researchers have extended the original theorem to apply under more general and realistic market settings. Despite these successful theoretical generalisations, several recent studies have questioned the validity of the theorem's application. Numerical instability plagues the unconstrained recovery algorithm, while constrained versions lead to recovered physical probabilities being too similar to risk-neutral probabilities. In its stated form, then, the recovery theorem does not seem to work empirically.

In this contribution we use the theorem by making its output semi-parametric. We therefore assume that one, or both, of the physical density and pricing kernels is described by a parametric function and then look to recover only the necessary function parameters. This increases numerical stability and ensures economically sensible output. We apply the recovery theorem under the assumption that the physical density follows a lognormal-mixture model.