Quantitative Finance > Pricing of Securities

Modelling Information Flows in Financial Markets

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This paper presents an overview of information-based asset pricing. In this approach, an asset is defined by its cash-flow structure. The market is assumed to have access to "partial" information about future cash flows. Each cash flow is determined by a collection of independent market factors called X-factors. The market filtration is generated by a set of information processes, each of which carries information about one of the X-factors, and eventually reveals the X-factor. Each information process has two terms, one of which contains a "signal" about the associated X-factor, and the other of which represents "market noise". The price of an asset is given by the expectation of the discounted cash flows in the risk-neutral measure, conditional on the information provided by the market. When the market noise is modelled by a Brownian bridge one is able to construct explicit formulae for asset prices, as well as semi-analytic expressions for the prices and greeks of options and derivatives. In particular, option price data can be used to determine the information flow-rate parameters implicit in the definitions of the information processes. One consequence of the modelling framework is a specific scheme of stochastic volatility and correlation processes. Instead of imposing a volatility and correlation model upon the dynamics of a set of assets, one is able to deduce the dynamics of the volatilities and correlations of the asset price movements from more primitive assumptions involving the associated cash flows. The paper concludes with an examination of situations involving asymmetric information. We present a simple model for informed traders and show how this can be used as a basis for so-called statistical arbitrage. Finally, we consider the problem of price formation in a heterogeneous market with multiple agents.

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