Asset Pricing under Ambiguity and Heterogeneity

A Thesis Submitted for the Degree of
Doctor of Philosophy

by

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Declaration of Authorship

I certify that this thesis has not previously been submitted for a degree nor has it been submitted as part of requirement for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

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Abstract

Financial markets are becoming increasingly complex, volatile and uncertain in light of the recent financial crisis. Markets are characterised by a variety of anomalies and stylised facts that pose challenges to the traditional asset pricing theory, where market is represented by a single agent and investor is always perfectly aware of his (her) own preference forming rational expectation by maximising his (her) expected utility. However, empirical evidence suggests that instead, markets are populated with boundedly rational investors that are heterogeneous in beliefs and can often follow some heuristic trading rules. Further, the famous thought experiment known as the Ellsberg's Paradox reveals evidence that contradicts utility maximisation theory. In fact, it implies that investors are ambiguity-averse and prefer taking on risk in situations where they know specific odds rather than an alternate risk scenario in which the odds are completely ambiguous.

This thesis contributes to the development of the ambiguity literature by modelling uncertainty and incorporating boundedly rational behaviours to examine their joint impact on asset price dynamics as well as the various market anomalies. First, we provide a multi-asset setup to understand implication of ambiguity on correlated assets, and therefore market liquidity in time of uncertainty. Second, we propose two new dynamic ambiguity models and examine their impact on various market behaviours such as price deviations from the fundamental values, excess volatility, and long memories in return volatility. The main contributions are described below.

(i) Different from a single risky asset market, Chapter 2 adds to the ambiguity literature by exploring a multi-asset setup under ambiguity and heterogeneity, and studies the consequent implication on market illiquidity during a market downturn. We firstly explore how market illiquidity is impacted by ambiguity when risky assets are correlated. Second, we add on heterogeneity and study the implication

of heterogeneous beliefs on the first and second moments of a risky asset, and consequently the spillover effect among the correlated assets on equilibrium price, risk-free rate and market liquidity.

(ii) Although some researchers have discussed the relationship between ambiguity and volatility, most of these models remained in static setups and have not explicitly demonstrated models' capabilities to generate market anomalies and stylised facts in price and return series. Chapters 3 and 4 contribute to the literature by filling this gap. We develop dynamic ambiguity models that incorporate heuristic behaviours that investors exhibit in markets. By assuming that fundamental value of the risky assets are becoming increasingly ambiguous in times of market turmoils, we introduce models that incorporate three types of investors whose beliefs are updated through some heuristic strategies, namely fundamentalists, trend followers and noise investors. In particular, fundamentalists are assumed to be ambiguity-averse due to ambiguity about the fundamental value. The core difference between Chapters 3 and 4 lies in how we incorporate ambiguity in the fundamentalists' beliefs. In Chapter 3, we consider a simple and exogenous approach in structuring ambiguity, whereas Chapter 4 allows ambiguity to be endogenously embedded through an ambiguous signal received by fundamentalists and a Bayesian updating mechanism.

Overall, this thesis shows that asset pricing models under ambiguity and boundedly rational behaviour can help to characterise markets in time of turmoil and demonstrate models' capability to generate various financial market anomalies and stylised facts.

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