# Downside Risk and Volatility Dynamics in Financial Markets

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Thesis submitted in fulfilment of the requirements for the degree of

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under the supervision of Assoc. Prof. Jianxin Wang and Assoc. Prof. Christina Nikitopoulos Sklibosios

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# Certificate of Original Authorship

I, Alice Carole Thomas declare that this thesis, is submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the School of Business (Finance Discipline Group) at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise reference or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any other academic institution.

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# Abstract

Adverse price movements in stock and energy markets threaten the stability and efficiency of financial markets. Devising more accurate risk measures is essential for protecting investment portfolios against these shocks. Energy futures markets have been shown to have volatility structures comparable to traditional stock markets, perhaps even more so after the financialization of commodities markets. Their interconnectedness means that macro-economic and energy-specific factors, through newly identified impact channels, can influence energy price.

The main contributions of this thesis include:

- *Forecasting with new measures of extreme downside risk – Chapter 2.* The first study proposes two alternative measures of stock-specific extreme downside risk, based on the downside realized semi-variances and cumulative returns. The suitability of these measures for improving the prediction of extreme downside risk is assessed against existing metrics in the literature. Their forecasting performance is evaluated by adopting a more industry-relevant forecasting horizon of one month. The proposed measures have better in-sample and out-of-sample forecasting performance. The performance of an investment strategy that precludes stocks with a high extreme downside risk is evaluated. Irrespective of the forecasting horizon, the new measures earn the highest risk-adjusted returns. This strategy may serve as a tool for fund managers to efficiently time the market.
- *The economic impact of daily volatility persistence on energy futures markets – Chapter 3.* The second study examines the role of daily volatility persistence in transmitting information from the macro-economy in the volatility of energy markets. Macro-economic factors, such as the VIX, the credit spread, and the Baltic Exchange Dirty Index, impact future volatility via the volatility persistence in crude oil markets. Conversely, the impact of these factors on the volatility persistence of natural gas markets is limited. There is also evidence that traditional market state variables, including returns and variances, are also transmitted to volatility via the volatility persistence channel. This variation in daily

volatility persistence is economically significant, contributing to a large proportion of future volatility. Based on the utility benefits of volatility forecasts, the volatility persistence-adjusted volatility models provide almost three times as much benefit to investors compared to competing volatility models, even after accounting for transaction costs and varying trading speeds. This chapter identifies a new transmission channel of macro-economic information in the volatility of energy markets with substantial economic impact in forecasting.

▷ *Liquidity provision channels and oil price volatility – Chapter 4*. The third study re-evaluates the role of hedgers and speculators as liquidity providers and their effects on weekly oil price volatility. By using two measures of hedging pressure that capture the liquidity provision by speculators and hedgers, hedging pressure driven by the speculators' liquidity provision decreases volatility, while hedging pressure induced by hedgers' liquidity provision increases volatility. Oil volatility tends to be more responsive to hedgers' short-term liquidity provision than variations induced by speculators' liquidity provisions. The liquidity provision by hedgers and speculators is significant determinant of volatility in inverted and normal markets with the effects being more pronounced in inverted markets. Further financial and business cycle risks have a measurable impact on how liquidity provision channels affect volatility. This chapter refines the role of hedgers and speculators in determining oil price volatility via two distinct liquidity provision channels with opposite effects on volatility.