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Aggregate volatility risk and the cross-section of stock returns: Australian evidence

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ABSTRACT

This study examines the relation between aggregate volatility risk and the cross-section of stock returns in Australia. We use a stock's sensitivity to innovations in the ASX200 implied volatility (VIX) as a proxy for aggregate volatility risk. Consistent with theoretical predictions, aggregate volatility risk is negatively related to the cross-section of stock returns only when market volatility is rising. The asymmetric volatility effect is persistent throughout the sample period and is robust after controlling for size, book-to-market, momentum, and liquidity issues. There is some evidence that aggregate volatility risk is a priced factor, especially in months with increasing market volatility.

1. Introduction

Understanding the relation between market volatility and stock returns is important to both academics and practitioners alike, especially in the areas of asset allocation, valuation, and risk management.[1] Innovations in market volatility affect investors' investment choices either by changing their forecast of future market performance or by changing the trade-off between risk and return. According to the multifactor models of Merton (1973) and Ross (1976), if market volatility is a systematic risk factor, it should be priced in the cross-section of stock returns.

Implied volatility (VIX) derived from index options often reflect investors' expectation of future stock market volatility (see Whaley, 2000, 2009). Using changes in the VIX index as a proxy for aggregate volatility innovations, Ang et al. (2006) find that stocks with high sensitivity to aggregate volatility earn low average future returns. Dennis et al. (2006) confirm the result and highlight the importance of the asymmetric return responses to negative shocks in aggregate volatility. Delisle et al. (2011) extend these findings by showing a negative cross-sectional relation between aggregate volatility risk and stock returns, which only exists when aggregate volatility is rising.

While the knowledge about the relation between aggregate volatility risk and stock returns in the U.S. markets is advanced, there is a paucity of literature on aggregate volatility in the Australian market due to data limitations. Most Australian studies could only utilize a short sample period and focus on the information content of market volatility and/or implied volatility at the aggregate level. For example, Li and Yang (2009) and Frijns et al. (2010a) show that implied volatility is a better predictor of future realized aggregate volatility than other commonly used econometric models. Other Australian studies find a negative relation between

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[1] We use 'aggregate volatility' and 'market volatility' interchangeably throughout the paper.

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aggregate volatility risk and market returns (Frijns et al., 2010b), but fail to find any relation at the sector or industry level (Loudon and Rai, 2007). The conflicting academic findings at the aggregate and industry levels are puzzling.

Recently, the Australian Securities Exchange (ASX) started to post real-time S&P/ASX200 VIX index (A-VIX) on its website as an indicator of current market sentiment. The ASX also began trading futures on VIX due to increasing demand from hedgers and investors alike.[2] The lack of evidence in academic research on the relation between VIX and stock returns is troubling as there seems to be a disjoint between theory and empirical evidence. These unresolved issues necessitate further studies on aggregate volatility risk in the Australian market.

This study fills the gap in the literature by being the first study to examine the cross-sectional relation between aggregate volatility risk and stock returns in Australia. We are also the first to conduct asset-pricing tests on aggregate volatility risk as a priced factor in explaining the cross-sectional returns in Australia. Moreover, our study highlights the potential asymmetric relation between aggregate volatility risk and stock returns in Australia. These tests were impossible to conduct previously due to data constraints.

Our study of the relation between aggregate volatility risk and stock returns in the Australian market is important. It can bridge the gap between theoretical predictions and empirical evidence on the relation between aggregate volatility risk and stock returns in Australia, which is absent in previous studies. It can also provide practical relevance of academic research to financial practitioners in light of the recent popularity of derivative products on the ASX200 VIX index. Moreover, a study of the Australian market enables us to examine whether an investment strategy based on aggregate volatility risk is practical after considering liquidity issues in a market populated by a large number of micro stocks, but dominated by a small number of large stocks.[3] Furthermore, our study provides an out-of-sample test of the U.S. evidence on the pricing of aggregate volatility risk. It may potentially rule out the data-mining concern raised by Lo and MacKinlay (1990) in typical asset-pricing studies.

Using a stock's sensitivity to innovations in aggregate volatility as a proxy for aggregate volatility risk, we find that aggregate volatility risk is negatively related to the cross-section of stock returns in Australia when aggregate volatility is rising, but not when it is falling. The asymmetric volatility effect hinders the attempts in previous studies (e.g. Loudon and Rai (2007)) to uncover the cross-sectional link between aggregate volatility and stock returns in the Australian market. Further analyses show that this asymmetric relation is persistent throughout the sample period. Size, book-to-market, momentum, and liquidity issues cannot explain the asymmetric relation. Moreover, our asset pricing tests show that aggregate volatility risk is systematically priced, especially in months when innovations in aggregate volatility are positive. However, the incremental explanatory power of the aggregate volatility risk factor is limited in addition to the commonly used Fama and French (1993) three factor model, augmented by a momentum factor.

Our findings contribute to the existing research on the cross-sectional determinants of stocks returns and asset-pricing anomalies in the Australian market.[4] While previous studies show the relations between stock returns and firm size, book-to-market ratio, past returns, asset growth, amongst others, we find a robust negative relation between aggregate volatility risk and stock returns, based on a sound theoretical foundation. Furthermore, we extend the Australian asset-pricing literature (e.g. see Gray and Johnson (2011); Brailsford et al. (2012); Chai et al. (2013)) by examining the potential role of aggregate volatility risk as a factor in the cross section of stock returns. In general, our study provides guidance to future asset-pricing studies in Australia.

The remainder of the paper proceeds as follows. Section 2 provides a brief literature review and the hypotheses. Section 3 describes the sample and variables. Section 4 reports the empirical results. Section 5 concludes.

2. Background, literature review, and hypotheses

The multifactor models of Merton (1973) and Ross (1976) imply that risk premiums are related to the conditional covariance between asset returns and changes in state variables that affect investors' time-varying investment choices. In the models of Campbell (1993, 1996), investors are concerned with market returns and changes in the expectation of future market returns. Chen (2002) extends the models to incorporate investors' concern with aggregate future volatility risk. Aggregate market volatility affects investment opportunities by changing the risk-return trade-off or investors' expectation of future market returns. Increases in aggregate volatility limit investors' investment choices as periods of increased volatility often coincide with adverse market movements (Whaley, 2000). Facing time-varying investment opportunities, risk-averse investors would like to hedge against a decrease in expected future market returns by purchasing stocks that are positively correlated with innovations in aggregate volatility. The demand for such stocks increases their current prices, resulting in lower expected returns in the future. This line of reasoning suggests that firm's sensitivity to innovations in market volatility is a priced risk factor in the cross-section of stock returns.[5]

Implied market volatility (VIX) extracted from market index options is commonly used as an estimate of investors' prediction of future market volatility (Whaley, 2000). Using VIX from the S&P100 index options as a proxy for aggregate volatility, Ang et al. (2006) test the hypothesis of Campbell (1993, 1996) and Chen (2002) and find that aggregate volatility risk is priced in the cross-section of stock returns in the U.S. markets. In contrast, using portfolio formed by sectors as test assets, Loudon and Rai (2007) find no evidence that aggregate volatility risk is priced in the Australian equity market.

Research on the role of aggregate volatility risk on stock returns in the Australian market is limited by data availability due to the delayed introduction of index options in Australia. In particular, the Australian Securities Exchange (ASX) only started issuing options on the ASX200 index in the early 2000s and futures on the S&P/ASX200 VIX index in October 2013 due to increasing

[2] See www.asx.com.au and www.asx.com.au/products/sp-asx200-vix-index.htm.

[3] See the World Federation of Exchanges website: http://www.world-exchanges.org/statistics.

[4] See O'Brien et al. (2010) and Dou et al. (2013) for a brief review on Australian asset-pricing anomalies.

[5] See Ang et al. (2006) for detailed discussions.