Does NVIX matter for market volatility? Evidence from Asia-Pacific markets

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Abstract
Forecasting financial market volatility is an important issue in the area of econophysics, and revealing the determinants of the market volatility has drawn much attention of the academics. In order to better predict market volatilities, we use news-based implied volatility (NVIX) to measure uncertainty, and examine the predictive power of NVIX on the stock market volatility in both long and short-term among Asia-Pacific markets via GARCH-MIDAS model. We find that NVIX does not well explain long-term volatility variants in the full sample period, and it is positively associated with market volatility through a subsample analysis starting from the Financial Crisis. We also find that NVIX is more efficient in determining short-term volatility than the long-term volatility, indicating that the impact of NVIX is short-lived and information that investors concern could be quickly reflected in the stock market volatilities.

Keywords:
News-based implied volatility
Uncertainty
Stock market volatility
GARCH-MIDAS
Volatility predictability

1. Introduction
Predicting market volatilities is an important issue in the area of econophysics, as the related complex systems could be applied to the economics and finance [1–3]. Mantegna and Stanley [4] find the dynamics and turbulence of market index. Wang et al. [5] use multifractal detrended fluctuation analysis and find the inefficiency from a volatility perspective. Cizeau et al. [6] show that the volatility distribution can be describe by a log-normal function, which also reveals the predictability of financial market volatility. In addition to the statistical and physical properties of market volatility, some research focus on the determinants of the stock market volatility. One of the common factors is the economic fundamental [6–9]. However, David and Veronesi [10] indicate that the relationships between volatilities and macroeconomic variables are very complex. Engle and Rangel [11] show that a board of macroeconomic variables jointly explains a
very small proportion of market volatility. The complexity of the volatility determinants is also revealed by the models including stationary Markovian processes, relativistic Brownian motion, fractality analysis and econophysical complex networks [12,13]. Recently, some empirical evidence show that macroeconomic variables, including real GDP growth, industrial production growth, unemployment rates, term spread and inflations, are efficient in predicting aggregate volatilities [14–16].

Previous literature mark the disagreements of volatility predictability by fundamentals, and we would like to provide evidence from the perspective of uncertainty following the current research. Uncertainty has been highlighted in financial asset pricing, as Bloom [17] brings out the uncertainty shocks on stock market return and firms, and it is also combined with econophysics [17–21]. Time variation in uncertainty influences investors’ consumption and portfolio choice decisions, generating variance premium fluctuations and helping explain their power to predict stock returns [22]. Pástor and Veronesi [23] indicate the negative relationships between asset returns and policy uncertainty with general equilibrium models. More works focus on digging the relationships empirically. Beketa et al. [19] find that uncertainty plays a large role in the term structure and is the driver of counter cyclical volatility of asset returns. Anderson et al. [18] find the similar results. Brogaard and Detzel [24] present that economic policy uncertainty proposed by Baker et al. [25] would positive forecast log excess market returns, implying higher uncertainty leads to higher returns. Asgharian et al. [26] present the impact of macroeconomic uncertainty on stock and bond market. Segal et al. [27] decompose uncertainty into ‘good’ and ‘bad’ components and find their different role in predicting asset prices. Aloui et al. [28] use a copula approach to investigate the effect of uncertainty on crude oil returns. Joo and Park [29] examine the time-varying causal relationship between the oil price uncertainty and their returns. Current literature focus on the relationships between the stock market and uncertainty in a return level, and find uncertainty could decrease returns in both stock and market index levels. However, the role of uncertainty in generating asset volatilities has not been deeply found. Explorations of uncertainty in explaining market volatility would be useful complementary in the field of financial volatility predictability and econophysics.

The empirical literature reflect the fact of rapid development in uncertainty measurements. Various uncertainty measurements are proposed, including conditional variance of economic indicators [30,31], political election cycles [32,33], Economic Policy Uncertainty Index (EPU here in after), macroeconomic uncertainty index (MUI here in after), degree of disagreement of forecasting or expectation data [18], common volatility from economic indicators [34,35]. Among these uncertainty measurements, the most commonly used proxy of uncertainty in empirical works is EPU. However, several shortcomings of EPU and uncertainty index alike are found that they are limited to fundamental levels, and they only consider the economic related indicators. Interestingly, Manela and Moreira [36] recently propose a different index of uncertainty called News-based Implied Volatility (NVIX for short). It is a text-based measure of uncertainty, which focuses on investors’ concerns about exact topics in the Wall Street Journal, but not a proxy in fundamental levels. NVIX is much different from EPU in the following aspects. First, the underlying components are quite different. NVIX is estimated based on the co-movement between the front-page coverage of the Wall Street Journal and CBOE option-implicated volatility (VIX). It is an expansion of VIX combined with information dug from unique words of business press. However, EPU contains three components, measuring uncertainty in newspapers, number of federal tax code provisions and disagreement among economic forecasters. Secondly, NVIX considers the investors’ concerns or attentions on events. The topics or keywords from business press capture the investor attention, which is also a key factor of asset pricing in the return and the volatility level [37,38]. On the contrary, EPU and other uncertainties are considered to be macroeconomics related, as they only focus on the information of economic policies and macroeconomic variables, ignoring the impact of investor behaviors. Thirdly, NVIX is estimated through machine learning techniques, and EPU is constructed based on the number of keywords in newspapers. Considering the complexity and underlying principles of NVIX, we would provide more evidence of the relationships between stock market volatility and uncertainty.

Our motivations to investigate the role of uncertainty are straight-forward. Firstly, previous studies have shown that the predictability of fundamentals is quite complex, and it is necessary to find out new determinants on aggregate volatility. Secondly, it is found that uncertainty is a key factor in financial asset pricing, however, the studies on relationships between uncertainty and market volatility are quite limited. This paper tries to provide further empirical evidence. Thirdly, we mainly focus on NVIX which is a new measure of uncertainty. Different from previous uncertainty index, NVIX captures the uncertainty from the average investors. In line with the literature focusing on the financial assets volatility and its determinants and the motivations of this paper, three contributions arise from the following aspects. Firstly, this paper contributes to empirical evidence on the role of uncertainty in determining stock market volatility in both long and short-term level. Previous empirical works just focus on the long-term volatility [14,16], few pays attention to the short-term component. It is expected that impact of uncertainty is short-lived. Globalization makes information transmission in a timely manner, and the related event effects would not last longer and investors quickly adjust their investment allocations.1 Besides, the investor behaviors including sentiments and attentions could be quickly reflected in the stock market prices [39]. In this paper, we employ GARCH-MIDAS for the impact of uncertainty on the long-term volatility and OLS for the impact on the estimated short-term volatility. This model is much different from the traditional GARCH models that model market volatility [14]. In addition, we set the burst of the Financial Crisis as the start of subsample analysis, which could provide more recent and accurate empirical evidence.

1 The attack of 911, Brexit and U.S. President Election have shown the quickly adjustments of investors, implying the short-term impact of uncertainty.
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