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#786; Lee and Ryu

This paper investigates the return-volatility relationship and its possible asymmetric behavior against the backdrop of two-model free implied volatility indices; the VIX (US) and VKOSPI (Korea).

A measure of risk on a certain stock option or portfolio can be modeled, in part, by the relationship between an assets return, i.e. change in price, to its variance, i.e. volatility. The correlation between these two quantities can be at times be symmetric or asymmetric (when negative return shocks often result in vol spikes, but the positive sock results in a dampened vol response).

While numerous studies have been conducted and show that this relationship is often mixed, it is worth noting that some supporting evidence has been found albeit, weakly, in US based markets. Furthermore, the quality of empirical data utilized in realizing any concrete relationship has in the past been hindered by lack of quality empirical data or implementation of suitable pricing models such as the GARCH-in-Mean model[1].

This paper attempts to re-examine the possibly asymmetric relationship between return and volatility by utilizing the Vector-Auto Regression (VAR) approach. In addition, this study reports the analysis and comparison of patterns of impulse responses of volatilities to positive and negative return shocks, which in turn yields the asymmetric volatility phenomenon in both markets (US and Korea).

Lee (2010) provides the foundation for this paper wherein, the authors extend the VAR model by modeling the dynamic behavior between any two economic variables through a comparison of the BVAR and BMAR representations. In this case, the two variables of concern are the Y_{1t} and Y_{2t}. Y_{1t} represents the log return on the stock index while the second variable, Y_{2t}, represents the differenced implied volatility index in each market. Additionally, the paper calculates the B^0 through the relation $B^0(B^0)^T = \Omega$ with additional restriction, $b_{11}{}^0+b_{11}{}^0=0$, which implies positive and negative shocks of equal magnitude on the variable Y1t. Given these descriptions for return and volatility this paper attempts to analyze the dynamic response of volatility to positive and negative return shocks.

To realize the dynamic characteristic of the return-volatility relationship, given the new VAR extension, the paper attempts to make use of implied volatility as opposed to other candidates such as realized and/or historical volatility. A form of implied volatility is utilized in this paper termed ‘model-free implied volatility’ of which VIX is mentioned as an ideal candidate due to its ability at potentially having more “explanatory power”[3] over other implied volatility candidates.

VIX is the model-free implied volatility index based on S&P 500 option prices. This volatility candidate is argued to have importance against the backdrop of this paper as a way to measure, if not leverage, risk within emerging markets such as the KOSPI200 index in Korea.

Based on the extension to the VAR framework and utilization of the recently published implied volatility index from the Korean KOSPI200 option prices, VKOSPI, a comparison is then made using their data between the periods of April 13th 2009 to September 9, 2011.

Results of this study suggest that asymmetric effects of positive and negative return do exist but their responses across US and Korean markets offer different magnitudes. For example, in this study, a shock is initialized within the US market (S&P500) with its effect observed in the Korean market with changes in VIX. Based on Figure 1[2] of the paper, a positive stock return is seen to yield a decrease in volatility of different magnitude when compared with a negative shock, which in turn yields an observed increase in volatility.

In addition, the paper also demonstrates the slight difference in the return-volatility relationship across such markets. The study suggests that positive return shock induces only slight initial increase in volatility [for KOSPI] while a negative shock induces a sharp initial increase in volatility. In essence, this study asserts the dominance of negative return-volatility from negative return shocks over positive relationship from positive return shocks.

The paper next illustrates forecast error variance decomposition of stock returns and volatility captured in Table 1[2] of the paper. This data illustrates the proportion of returns/volatility that can be explained by negative and/or positive return shocks. However, as the study points out, within US markets, it is the negative return shock that explains more than 99% of the forecast error of variance volatility. The study also finds significant but comparatively lower percentage (about 96%) of forecast error variance on volatility in Korean markets.

The result of this study and its data suggest a new extension VAR framework that can be effectively used to investigate asymmetric and volatility in both established and emerging markets as well as the characteristics of the return-volatility relationship within these markets.

While this conclusion can be surmised from the discussion of the paper, the paper is not suitable for publication in its current state. The discussion section in the paper needs to be improved and methodology and notation extended and explained better. The same is the case with the 4 exhibits at the end. No effort is made to explain what the variables are and what is on the 3 axis. The word 'Dynamic' seems to be used often without clear explanation of its relevance and context. Additionally it is found that a positive return shock has the effect of actually increasing implied vol in Korea. This is surprising and while it may be true, no reason is offered for it. Under what circumstances does the VKOSPI then decline in value? No attempt is made to explain what could possibly be the reason for the differential positive return induced impact on volatility in the two markets.
While it appears the researchers have found a curious but not very strong difference, additional information needs to be shed to warrant a referred paper. Was any type of signal

noise filtering applied to the VKOSPI data to see if the effect they notice is not a result of noise or an unknown new factor.

References

[1] – "Relationship between stock returns and volatility in international stock markets", *Qi Li et al,* 2005, Journal of Empirical Finance 12(2005), 650-665.

[2] – "Stock returns and implied volatility: a VAR approach", *Boo Song Lee & Doojin Ryu*, Research Letter.