Author Answers on the

"Heejoon Han, Ali M. Kutan, and Doojin Ryu (2015). Modeling and Predicting the Market Volatility Index: The Case of VKOSPI. Economics Discussion Papers, No 2015-7, Kiel Institute for the World Economy. http://www.economics-ejournal.org/economics/discussionpapers/2015-7"

Thank you very much for your great comments. We will revise our paper based on the valuable comments of the two Referees. Thank you very much for your valuable comments. If you give me the chance of the Revision (R&R; Revise and Resubmit), we will fully reflect all of the comments and enhance the quality of our paper.

Referee #2

Comment 1 of the 2nd Referee

By the way, is the dataset cleaner than others? Are those European/American options? What about the dividend yield to estimate?

Answer 2-1

The KOSPI 200 options is one of the most actively traded derivatives and the KOSPI 200 options market has maintained the top position based on its liquidity and trading volume until 2012. Until recently, its trading volume is much larger than the trading volume of the US options and that of the Eurozone options. This abundant liquidity makes this options market as prominent and "credible". Further, for the research purpose, the Korea Exchange (KRX) provides the "high-quality and clean" dataset on the KOSPI 200 options and its model-free implied volatility index, the VKOSPI. The KRX also provides the adjusted dividend yield for option pricing and valuation. Using this dividend yield, one can exactly calculate the option price and/or the implied volatility. Using the academic research fund, we bought the "high-quality dataset" directly from the KRX. The KRX guarantee that the data are credible.

Comment 2 of the 2nd Referee

VKOSPI index is published since April 13, 2009. The index has been recomputed by the authors, in order to extend the sample period from 26 March 2004. As normally the published index undergo many filtering constraints and usually it is computed from intra-daily data, did the author test that their methodology is consistent with the one applied by the Korean Exchange? I suggest to assess the differences between the exchange traded index and their recomputed index from 19 April 2009 on.

Answer 2-2

As we mentioned in Answer 2-1, the KRX provides the VKOSPI dataset and its related components. Using the risk-free rate, dividend yield, KOSPI 200 spot and futures index, and nearest and secondnearest maturity KOSPI 200 options, one can construct the historical series of the VKOSPI. Actually, our dataset is exactly same as the dataset provided by the KRX. The KRX now announces the historical VKOSPI dataset before its official publication date, and it undergoes the filtering process and rigorous consistent checks. About the sample period, it is a typo as you point out. We will correct it.

Comment 3 of the 2nd Referee

It is not clear if the paper uses non-overlapping time periods (Christensen and Prabhala, 2001), if not a method to correct the errors should be used.

Answer 2-3

We use the rolling-window estimation. We will clarify it in the revised version. We will also the paper of Christensen and Prabhala (2001) for the revision.

Comment 4 of the 2nd Referee

Another issue is the timing difference between the Korean and the US market (opening and closing times in day t and day t+1), have those differences been taken into account, in order to have a fair treatment of US and Korean factors?

Answer 2-4

Considering the market opening hours in the US and Korea, the information from Korean stock market in day t is dominated by the information from US stock market in day t-1 (US market is open overnight in Korean time.) For this purpose, we match the day t sample of the Korean market and the day t-1 sample of the US market. We exclude the holidays and use the interpolation method to process the dataset.

We focus on the leading emerging market where the US market plays a dominant role in its price discovery and information spillover process during the overnight period. Our analysis is based on the dataset of inter-continental markets where the operating hours do not overlap, as follows. We consider the timing differences as you point out.



Comment 5 of the 2nd Referee

Even if in principle different loss functions can be used and added to the picture, I would stress that the most important results are those based on the MSE function which is considered as robust to the presence of noise in the volatility proxy (Patton 2010).

There is no clear distinction between the "key model" and the "benchmark model", in Table 4 M6 is called the key model, but in the text (eq. 11) when explaining the DMW test, both "key" and "benchmark" models are recalled. I would not call "benchmark model" the other model(s).

Answer 2-5

As you suggest, we will stress the results based on the MSE values. We will also consider the study of Patton (2010). We will also use other terms rather than the benchmark model.

Comment 6 of the 2nd Referee

The "key" model, model 6, is chosen according to the adjusted R2 (adjusted R2 are pretty high and very similar across models). Based on slight difference the authors conclude that one model is better than the other. No test is conducted in order to see if the difference is significant from a statistical point of view in sample.

Answer 2-6

We will compare the in-sample fitting abilities of the suggested models based on the within-sample fitted values. Further, we will find another specification tests for the robustness check.

Comment 7 of the 2nd Referee

In order to assess which is the best model, I suggest also the methods proposed in Hansen (2005).

Answer 2-7

We will do. As you suggested, we will carry out the SPA of Hansen (2005) and additional tests in the revised version.

Comment 8 of the 2nd Referee

In Table 4, the Diebold and Mariano test is pursued only between the favourite model (M6) and the others, maybe it could have been pursued also between the other couples of models in order to have a more complete picture of the importance of the different variables used (see e.g. Muzzioli, 2013).

Answer 2-8

We will do considering the study of Muzzioli (2013).

Comment 9 of the 2nd Referee

Recent financial crisis: do the results change before and after the crisis? (the estimation period ends just before the crisis (May 22, 2008))

Answer 2-9

Of course, we can carry out the subsample analysis. However, there is one thing to be pointed out. To obtain the first 1-step ahead out-of-sample forecast, we use the estimation period before May 22, 2008. To obtain the second (next) 1-step ahead out-of-sample forecast, we "roll-over" estimation period. So, your comment that "the estimation period ends just before the crisis (May 22, 2008)" is not the case. In the revised version, we will clarify the expressions, so that the authors and referees are not misunderstood.

Comment 10 of the 2nd Referee

The writing needs improvement. Edit the paper, spell check. Correct the misprints throughout the paper etc...

I would add a Table with the descriptive statistics of all the series under consideration.

Answer 2-10

We will revise our paper based on a native speaker's proof-reading. We will also add the descriptive statistics table.

Referee #1

Comment 1 of the 1st Referee

This paper employs seven versions of HAR models to exam the predictive ability of a set of exogenous

variables for implied volatility index that appears very redundant exercise. I can't see the point why the authors need a variety of models which are only different from each other by having different combinations of the same set of variables. There should be a very simple alternative available to deal with the same issue instead. That is, one can firstly include all the considered variables in the model, use the stepwise procedure to remove all the insignificant variables at the second step, and at the end to analyse predictive ability just relying on the final version of the model

Answer 1-1

We have already test all nested models as you suggested. After deleting insignificant or economically inconsistent coefficients, we confirm that the model "M6" is the most explanatory model. Our original intention is that, considering that stock market returns between the US and Korean markets are correlated, we tabulated various models which include Korean market variables or US market variables or both. In the revised version, we can consider the realized volatility measure as an additional explanatory variable. In the revised version, we can also fully explain the difference among the suggested models for the clarity and report untabulated tables.

Comment 2 of the 1st Referee

In contrast with the studies in US and other important markets, the authors conclude that the return of stock market does not predict the VKOSPI. This seems a bit counter-intuitive. It is worthwhile to further try stock market realized volatility instead of return to see whether the information from stock market has predictive power on implied volatility index. A simple HAR model may not be appropriate if the two volatilities are highly related. It is interesting to develop a bivariate HAR model with exogenous variables to re-exam the relationship.

Answer 1-2

Based on our model estimation results, the KOSPI200 spot returns have little predictive power for the VKOSPI after controlling macroeconomic variables and US market performance and shocks. One conjecture is that, considering the market opening hours in the US and Korea, the information from Korean stock market in day t is dominated by the information from US stock market in day t-1 (US market is open overnight in Korean time.) Related to this, please note that we focus on the leading emerging market where the US market plays a dominant role in its price discovery and information spillover process during the overnight period. This is the first study which analyzes this issue using the dataset of inter-continental markets where the operating hours do not overlap, under the HAR model framework.



Further, we can consistently interpret our results based on the "risk-appetite" explanation. The VKOPSI is a fear gauge measure for the leading emerging market. For example, there are many studies on CDS market, which analyze the which factor affects the attitude of investors toward the risk and their fear, between domestic macroeconomic variables vs. global market variables (which are represented by the US market variables). In the revised version, we will explain these based on the recent articles of finance literature.

Of course, as you suggested, we will develop a bivariate model using the realized volatility measure. We believe that we can implement it. Considering the volatility persistency, we may use the unexpected component in the realized volatility in the revised version. Meanwhile, if the referee suggests a more specific alternative bivariate model, we would happily estimate it.

Comment 3 of the 1st Referee

From empirical study perspective, it is not clear to me why the author particularly focused on Korean market. Does this market significantly different from US market which needs either new model development or new empirical analysis? Therefore, it would be better to state the purpose of this study more clearly in Section 2.

Answer 1-3

As we explained in Answer 2, we focus on the leading emerging market where the US market plays a dominant role in its price discovery and information spillover process during the overnight period. This is the first study which analyzes this issue using the dataset of inter-continental markets where the operating hours do not overlap, under the HAR model framework. As you suggested, we will add more explanation why we focus on the KOSPI 200 options market and the VKOSPI in Section 2. In addition to the ample liquidity, unique investor participation rates, fast growth, there are many reasons why we analyze this market.

Comment 4 of the 1st Referee

The sample period of the data spans from 2004-2013 which undergoes the financial crisis period. It would be interesting to conduct the same analysis using subsample periods, such as pre-crisis and post-crisis periods, and see whether there is a structure break in predictive ability of these variables.

Answer 1-4

As you suggested, we will carry out the additional sub-sample analysis.

Comment 5 of the 1st Referee

With respect to forecasting comparison, the author uses DM test that is useful to make pairwise comparison. It would be better to use SPA test of Hansen which is more suitable to rank a set of candidate models.

Answer 1-5

As you suggested, we will carry out the SPA and additional tests in the revised version.