Nikkei 225 in November

As of the end of November, the Nikkei Stock Average (Nikkei 225) stood at 17459.85 up 1046.09 points, or 6.37%, from the end of October, which rose for three months in a row. One reason for the rise was because the BOJ's additional monetary easing announced on October 31st has resulted in the yen depreciation and improvements in expectations of Japanese exporters' performances. Also a government decision on the postponement in the consumption tax hike seemed to affect business confidence positively in the short term.

This month's Topic: Could the realized volatility provide a new perspective to investments?

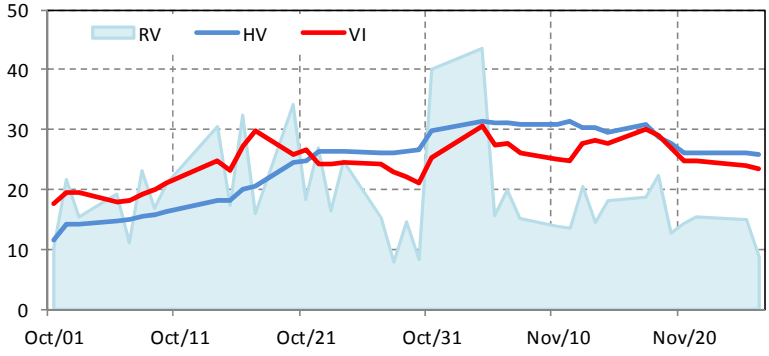
Market volatilities have got more and more attentions from the participants. Historical Volatility (HV) and Implied Volatility (IV) are well known as the indicators of the volatilities. Nikkei has calculated and published volatilities for both HV and IV on the Nikkei 225. The HV is defined as the volatility based on daily returns for the past 20 days while the Nikkei Stock Average Volatility Index (Nikkei 225 VI), sort of IV, indicates the expected degree of fluctuation of the Nikkei 225 in a month ahead (click here to know more). As the greater the index values are, the larger fluctuation investors expect in the market, the index is used as a signal to know the market expectation in the future.

However, a type of volatility rather than the two volatilities has been recently used more in stock markets. It is called "Realized Volatility (RV)". The RV is generally computed using the intra-day prices, e.g. every one minute for the past shorten period, .e.g. in a day.

Let's compare three types of volatilities on the Nikkei 225. Although there are varied methodologies for the RV calculations, the RV for this analysis is defined as a squire root of sum of squared one minute intra-day returns in a day. When the total 300 figures of the intra-day index level are named *IDXi* (*i*=1 and *i*=300 mean one minute past nine and closing time on the day respectively), the calculation formula is defined as $\mathrm{RV} = \sqrt{\sum_{i=1}^{n}\left\{\log\left({}^{IDX_i}/_{IDX_{i-1}}\right)\right\}^2}$. As there are no index figures in the night time and the lunch break, the returns at 9:01 and 12:31 are changes from the previous day's closing and the closing in the morning session respectively. Also the RV is annualized like the HV and VI on the Nikkei 225.

Figure 1 describes a comparison among the HV, VI and RV in the past two months. At a glance it is clear that the RV is fluctuated the most. Although the VI is HV are less volatile, the HV tends to remain high in the situation that the VI and RV were settled down late October because the HV was affected by the

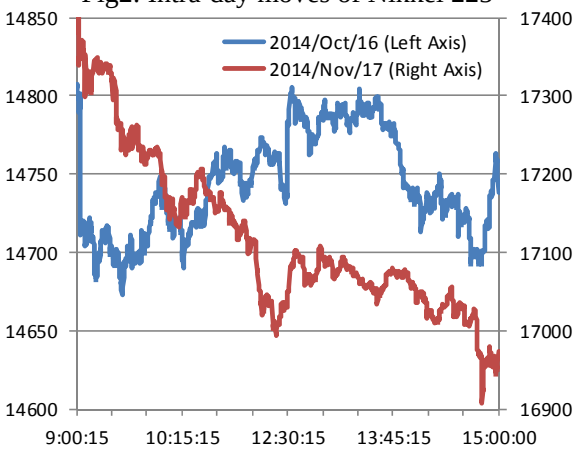
Fig1: Comparison among HV, VI and RV (Oct 1 to Nov 28)



fluctuation for the past 20 days.

What is the characteristic of the RV as the indicator? Using prices of the Nikkei 225 on very volatile days could clarify the difference. Figure 2 describes the intra-day moves of the Nikkei 225 on October 16 and November 17. Although the moves of the two days were similar in that the Nikkei 225 fell sharply from the previous day, there were big differences between the intra-day moves on the two days. The RV on the index on October 16th (33.08) was much greater than that on November 17th (20.41), while the VI on the two days were high similarly.

Fig2: Intra-day moves of Nikkei 225



Tab1: Comparison between Oct16 &Nov17

	Oct/16	Nov/17
Return	-2.22%	-2.96%
VI	27.16	30.01
RV	33.08	20.41

Figure 2 describe the difference in the intra-day moves of the Nikkei 225 clearly. The index was going down gradually in one way on November 17th. Reversely, on October 16th, it was significantly fluctuated in that it plunged at the opening but it partly recovered in the afternoon session, which drove up the RV that reflects the intra-day fluctuations of the Nikkei 225. The RV might be more noticeable in that it could provide a new perspective in gauging not only market volatilities but also its activity level, although the HV, VI and trading values of the market etc. could have similar roles for such indicators.

Performance Summary of November 2014

○Nikkei 225 and its derived indices (Data as of end of November)

Name of Index	Index Value	Monthly Return	Avg Return	Volatility	Yealy High	The Date	Yearly Low	The Date
Nikkei 225	17459.85	6.37%	0.05%	1.28%	17490.83	14-Nov	13910.16	14-Apr
Nikkei 225 TR	25665.29	6.38%	0.06%	1.28%	25710.72	14-Nov	20271.52	4-Feb
Nikkei 225 VI (Volatility)	23.80	-5.63%	0.16%	5.64%	33.21	4-Feb	14.00	17-Jul
Nikkei 225 VI Futures	50602.56	15.56%	-0.22%	2.45%	97741.36	4-Feb	38902.54	29-Sep
Nikkei 225 Covered Call	14949.73	2.56%	0.06%	1.11%	14949.73	28-Nov	12348.19	4-Feb
Nikkei 225 Risk Control	16564.17	3.18%	0.02%	0.73%	16575.54	14-Nov	14898.08	14-Apr
Nikkei 225 Leveraged	12780.17	12.81%	0.11%	2.56%	12846.40	14-Nov	8275.01	14-Apr
Nikkei 225 Inverse	2843.98	-6.28%	-0.05%	1.28%	3651.06	4-Feb	2843.47	14-Nov
Nikkei 225 Double Inverse	3808.52	-12.44%	-0.11%	2.56%	6467.31	4-Feb	3808.52	28-Nov

Name of Index	Index Value	Change	Hist. High	The year	Hist. Low	The year
Nikkei 225 DP	240.53	15.19%	240.53	2014	81.35	2002

○Benchmark and other indices

Name of Index	Index Value	Monthly Return	Avg Return	Volatility	Yealy High	The Date	Yearly Low	The Date
JPX-Nikkei Index 400	12835.53	5.45%	0.06%	1.17%	12849.27	25-Nov	10314.83	14-Apr
Nikkei 300	285.25	5.80%	0.05%	1.17%	285.25	28-Nov	229.49	14-Apr
Nikkei China Related 50	1533.59	8.43%	0.06%	1.18%	1533.59	28-Nov	1220.64	4-Feb
Nikkei 500 Average	1505.74	5.29%	0.06%	1.16%	1505.74	28-Nov	1191.33	4-Feb
Nikkei Japan 1000	1666.17	5.87%	0.05%	1.18%	1666.17	28-Nov	1335.72	14-Apr
Nikkei JASDAQ Average	2359.92	4.41%	0.08%	0.84%	2359.92	28-Nov	1890.85	19-May

Note: Avg Return and Volatility are calculated on the daily return for the past 1 year.
"Change" in the Nikkei 225 Dividend Point Index (Nikkei 225 DP) indicates a comparison with the value at the end of November 2013.
Historical High and Low in the dividend index were based on the values in the same month since 1998.

Index Business Office, Nikkei Inc.
indexes.nikkei.co.jp