Abenomics: Why was it so successful in changing market expectations?*

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Abstract

'Abenomics' refers to a new unconventional economic policy regime in Japan since late 2012. It consists of the three arrows: unconventional monetary policy (the first arrow), expansionary fiscal policy (the second arrow), and economic growth strategies to encourage private investment (the third arrow). After the new regime started, both the stock market and the foreign exchange market reacted very favorably. The purpose of this paper is to investigate why the markets reacted to the new regime so favorably. Unlike orthodox arguments, we focus on asymmetric behavior between local and foreign investors after November 2012. We show that under the new regime, foreign investors were aggressive in purchasing Japanese stocks and in selling the Japanese yen, while local investors were not. By using high frequency intra-daily data, both structural break tests and event studies show that various news shocks affected the stock price and the exchange rate only in Japan nighttime even if they were revealed in Japan daytime. Noting that local investors tend to trade in daytime, while foreign investors tend to trade in nighttime, this implies that the dramatic market responses to the new regime happened only in time zones when foreign investors were active. However, the asymmetry might have been less significant after the market crash on May 23, 2013.

Key words: unconventional policy, structural break, stock price, exchange rate, intra-daily data

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I. Introduction

'Abenomics' refers to the new economic policy regime advocated by the Prime Minister of Japan, Shinzo Abe. It is a set of policy measures meant to resolve Japan's macroeconomic problems. It consists of the three arrows: unconventional monetary policy (the first arrow), expansionary fiscal policy (the second arrow), and economic growth strategies to encourage private investment (the third arrow). Through the three arrows, the Japanese government tried to revive its economy through implementing bold economic policies that will pull its economy out of prolonged deflation, depreciate Japanese yen, and induce CPI inflation rate of 2% per year.

Both the stock market and the foreign exchange market reacted to the new policy regime very favorably. Figure 1 depicts daily data of the Japanese stock price index (Nikkei 225, 3pm in Tokyo) and the yen-dollar exchange rates (5pm in Tokyo) from January 2012 to September 2013. Before Mr. Abe came to power in December 2012, the stock price index stagnated around 9,000 yen. However, it rose up to 10,688 yen at the beginning of January 2013 and exceeded 15,000 yen on May 15, 2013. Abenomics was also successful in achieving depreciation of the yen, which had been stagnating around 80 yen per dollar in 2012. The yen-dollar rates depreciated to 88 yen at the beginning of January 2013 and to 102 yen on May 15, 2013. Both stock price increases and yen's depreciations did not persist after the market crash on May 23, 2013. But, the improved market enviroments can be the first step toward a much brighter future in the Japanese economy.

The purpose of this paper is to investigate why the markets reacted to the new policy regime so favorably. Unlike orthodox arguments, we focus on asymmetric behavior between local and foreign investors under the new regime. We show that under the new regime, foreign investors were aggressive in purchasing Japanese stocks and in selling the Japanese yen, while local investors were not. One may argue that the markets reacted favorably because they expected strong recovery of Japanese macro fundamentals under the new regime. It is true that after the dramatic changes of the stock prices and the Japanese yen, Japanese macro fundamentals also improved substantially. In particular, consumer spending pushed first quarter economic growth up 3.5 percent annually and remained strong in the second quarter of 2013. However, these improvements seem to be the results of the favorable market responses rather than the causes of them. In fact, various surveys clearly show that the improved confidences of Japanese consumers and enterprises lagged behind the favorable market responses. More importantly,

even in the markets, the responses to the new regime were very different between local and foreign investors. That is, various data suggest that after Mr. Abe came to power, only foreign investors were aggressive in purchasing Japanese stocks and in selling Japanese yen. This implies that there have been highly heterogenous views on Abenomics in the markets. In the following analysis, we explore whether the heterogeneity was a main source of the favorable market responses to Abenomics.

To capture heterogeneity, we particularly focus on intra-daily data which splits the market data into daytime changes and nighttime changes and explore whether there was conspicuous asymmetry across the time zones under Abenomics. In the analysis, we first apply structural break tests to examine whether stock prices and yen-dollar rates had structural break(s) in daytime and in nighttime. We then investigate whether news shocks under Abenomics were responsible to the structural break(s) by event-study analysis. We draw inferences about the impact of various news shocks on the market expectations from the behavior of stock prices and exchange rates in a window surrounding the announcements. The regression results suggest that before the market crash on May 23, 2013, various news shocks about Abenomics affected the changes of stock prices and exchange rates only in Japan nighttime even if the shocks were revealed in Japan daytime. Noting that local investors tend to trade in daytime, while foreign investors tend to trade in nighttime, this implies that the dramatic market responses under the new regime happened only in time zones when foreign investors were active. However, the asymmetry might have disappeared after the market crash on May 23, 2013.

Even among economists, foreign economists tended to be favorable to Abenomics. For example, in his column in New York Times, Krugman (2013) suggested that Japan had a prolonged slump mainly because it's hard getting policy makers to accept the need for bold action. He then praised Abenomics stating that "Mr. Abe has thumbed his nose at orthodoxy, with excellent results". IMF (2013) also wrote a favorable country report to Abenomics stating that "Japan's near-term economic prospects have improved with the adoption of vigorous macroeconomic policies combining fiscal stimulus with unprecedented monetary easing". In contrast, not a few Japanese economists were still conservative in evaluating Abenomics. For example, Ueda (2013) argued that "a non-negligible portion of the asset price response seems based on investors' excess optimism concerning the effectiveness of non-conventional monetary policy". At this stage, it is still too soon to evaluate which view is correct. However, the data

clearly shows that at least before May 23, 2013, it was foreign investors' responses that improved the market sentiments under the new regime. Given the fact, we may conclude that the initial impacts of Abenomics might not have been so successful unless foreign investors reacted to the new policy regime favorably.

In finance, the efficient-market hypothesis (EMH) asserts that financial markets are "informationally efficient". In consequence of this, one cannot consistently achieve returns in excess of average market returns on a risk-adjusted basis, given the information available at the time the investment is made. The semi-strong-form EMH claims that prices which reflect all publicly available information instantly change to reflect new public information. To the extent that EMH holds, the market should have had much larger responses in daytime than in nighttime because most of the news about Abenomics were revealed in daytime. Out finding, however, suggested the opposite. That is, the market responded more in nighttime than in daytime. This suggests that highly heterogeneous views persisted between daytime and nighttime investors at least at the first stage of Abenomics.

There are a large number of papers which explored unconventional policies in Japan (see, for example, Honda et al. (2007) and Ueda (2012)). But few explored them by using high frequency data such as intra-daily data. In investigating market-specific features by intra-daily data, our analysis has motivations that are similar to those in Ito and Roley (1987), Tsutsui and Hirayama (2010), and Fukuda (2012). These studies pointed out that there were different market responses in different time zones. However, no previous studies explored market-specific features under Abenomics. Investigating what happened under the new regime in Japan is worthwhile to be noted because Abenomics had dramatic impacts on the markets.

II. Who Responded to Abenomics Favorably?

After Mr. Abe came to power, both the stock market and the foreign exchange market reacted to the new policy regime very favorably. However, the reactions were asymmetric between local and foreign investors. In this section, we provide some basic statistics that may support such a view. When exploring who responded to Abenomics favorably, we can observe conspicuous asymmetric behavior between local and foreign investors when exploring who purchased Japanese stocks after November 2012.

Figure 2 reports which type of investors purchased Japanese stocks based on Trading Value by Investor Type TSE 1st Section by Tokyo Stock Exchange, Inc. The types of investors are local institutions, local individuals, local securities companies, and foreigners. It depicts their amount of net purchases (that is, purchases minus sales) in brokerage trading from January 2012 to September 2013. Before Mr. Abe came to power, we could not see distinct behavioral difference across the investors. However, net purchases of foreigner jumped up to 150 billion yen in December 2012 and kept increasing until May 2013. In contrast, net purchases of local institutions and local individuals took large negative values during the same period. The distinct behavior was especially conspicuous in April 2013 when new Governor of the Bank of Japan (BOJ), Haruhiko Kuroda, announced radical quantitative easing to achieve inflation targeting at a 2% annual rate in two years.

Table 1 summarizes how the amount of net purchases by each type of investors was correlated with the change in the stock price index (Nikkei 225) and with that in the yen-dollar exchange rate. The data is from Trading Value by Investor Type Tokyo and Nagoya by Tokyo Stock Exchange and is based on weekly data from January 2012 to September 2013. The correlation was in marked contrast between that by foreign investors and that by local investors. In case of foreign investors, the amount of net purchases had been positively correlated with the changes in the stock price index and the yen-dollar rates. This was true even before Abenomics started. But after Abenomics started, the positive correlation increased significantly. The correlation was especially high from December 2012 to May 2012 when the stock prices increased dramatically and the yen-dollar rate depreciated substantially In contrast, in case of local investors, the amount of net purchases had been positively correlated with the change in the stock price index and the yen-dollar rate. This was true both for local institutions and local individuals, although the absolute value of the negative correlation was much larger for local individuals. The results suggest that foreign investors played a leading role in improving the market sentiments in Abenomics at least before the market crash on May 23, 2013.

Figure 3 reports regional shares of foreign investors based on Investments in Listed Stocks by Nonresidential Investors (by region) by Tokyo Stock Exchange, Inc.. It depicts the amount of net purchases in brokerage trading from January 2012 to September 2013 in each region: North America, Europe, Asia, and others. Before Mr. Abe came to power, the amount of net purchases was limited in any region. However, the amount increased dramatically in December 2012 and

kept increasing until May 2013 in North America, Europe, and Asia. Among the three regions, net purchases of European investors were rather volatile reflecting unstable European economies. In contrast, net purchases of North American investors remained stable until May 2013. However, shares of foreign investors started to decline after June 2013.

III. When Did the Markets Respond Favorably?

(1) Japan Daytime and Nighttime

In the last section, we presented a view that both the stock market and the foreign exchange market reacted to the new policy regime favorably because Abenomics changed market sentiments of foreign investors at least until May 2013. In this section, we reexamine this view through exploring when the markets responded favorably. Exploring when the Japanese stock price increased and the yen-dollar rate depreciated, we can observe conspicuous asymmetry across the time zones after November 2012.

Figure 4 summarizes time zones we use for Japan daytime and nighttime in the following analysis. In case of Nikkei 225 Futures which is futures trading of NIKKEI 225 index, trade takes place not only in Osaka but also in Chicago. We define the price change from Osaka close (3:15pm in Osaka) to Chicago close (3:15pm in Chicago, 6:15am in Osaka) as the price change in Japan nighttime. We then compare it with that in Japan daytime which is defined as the price change from Chicago close to Osaka close. To check its robustness, we also use the changes of Nikkei 225 (spot trading). In case of Nikkei 225, trade takes place only from 9am to 3pm in Japan time. But potential orders in Japan nighttime are priced in the first few minutes after 9am in Japan time. We thus regard the price change from 3pm in Tokyo to 9:15am in Tokyo in the following business day as the price change in Japan nighttime and compare it with that in Japan daytime (from 9:15am in Tokyo to 3pm in Tokyo).

In contrast with the stock markets, the foreign exchange market is open 24 hours a day. We thus define the change of the yen-dollar rate from 9am in Tokyo to 5pm in Tokyo as the exchange rate change in Japan daytime and that from 5pm in Tokyo to 9am in Tokyo in the following business day as the exchange rate change in Japan nighttime. To check its robustness, we also report the change from 5pm in Tokyo to 5pm in New York as an alternative measure for that in Japan nighttime.

(2) The Stock Prices

Table 2 reports basic statistic (average and standard deviation) of the stock price change in two time zones from January 2012 to September 2013. It reports the change of Nikkei 225 Futures in Japan daytime and in Japan nighttime as well as that of Nikkei 225 in Japan daytime and in Japan nighttime. The table shows that in both Nikkei 225 Futures and Nikkei 225, the average was negative in daytime but positive in nighttime. This was true even before November 2012 but the difference was rather moderate. In contrast, the difference in the average became conspicuous between the two time zones after December 2012. This implies that after December 2012, the stock prices increased dramatically in Japan nighttime, while they kept having modest decreases in Japan daytime.

Figure 5 shows accumulated change of Nikkei 225 Futures and that of Nikkei 225 both in Japan daytime and in Japan nighttime since the beginning of November, 2012. It normalizes their value to be zero on October 31, 2012. The accumulated daytime change of Nikkei 225 Futures was negligible before May 22, 2013, while it turned to be negative after May 23, 2013. In contrast, the accumulated nighttime change amounted to 6385 yen on May 28, 2013 and remained high after that, although it became volatile after late May 2013. The result is essentially the same in the accumulated change of Nikkei 225. In nighttime, it increased dramatically after December 2012. In contrast, in daytime, its change was negligible, although it was positive from April 4, 2013 to May 20, 2013, while it remained negative after that.

Theoretically, both local and foreign investors can trade in any markets in the world. But it is natural to suppose that Japanese local investors tend to trade in Japan daytime, while foreign investors tend to trade in Japan nighttime. The above result thus suggests that the dramatic stock market boom under Abenomics happened only in time zones when foreign investors were active.

(3) The yen-dollar exchange rates

Table 3 summarizes basic statistics (average and standard deviation) of the change of the yen-dollar exchange rate from January 2012 to September 2013. It reports its change in Japan daytime (from 9am in Tokyo to 5pm in Tokyo) and that in Japan nighttime (from 5pm in Tokyo

to 9am in Tokyo in the following business day). To check its robustness, it also reports the change in an alternative Japan nighttime (from 5pm in Tokyo to 5pm in New York). It is easy to see that for the full sample, the average was negative in daytime but positive in nighttime. This implies that the Japanese yen tended to appreciate in daytime and depreciate in nighttime. Even before November 2012, the Japanese yen depreciated in nighttime and to appreciate in daytime. But the changes were moderate in both time zones. In contrast, after December 2012, the Japanese yen depreciated dramatically in nighttime, while it kept having modest appreciation in daytime. When we use the change in the alternative nighttime, the result is less dramatic. But even for the alternative nighttime measure, we can still observe dramatic nighttime depreciation of the yen after December 2012, although the nighttime yen started to appreciate after April 2013.

Figure 6 shows accumulated change of the yen-dollar rate in Japan daytime and that in Japan nighttime since the beginning of November, 2012. It normalizes their value to be zero on October 31, 2012. The change of the yen-dollar rates was negligible in daytime, although it had some marginal appreciation since January 10, 2013. In contrast, the accumulated depreciation of the yen-dollar rate in nighttime was substantial. It amounted to 23 yen/dollar on May 13, 2013 and kept its depreciated level after that. The essential feature remains true for the alternative nighttime measure. To the extent that Japanese local investors tend to trade in Japan daytime and that foreign investors tend to trade in Japan nighttime, this suggests that the dramatic depreciation of the yen under Abenomics happened only in time zones when foreign investors were active.

IV. Tests of Structural Changes in Intra-daily Data

In the last section, we showed evidence that both the stock price and the yen-dollar rate had asymmetric responses under Abenomics depending on the time zone. The asymmetric responses may explain why the markets reacted to the announced new policy regime so favorably. In the following sections, we will examine the validity of this conjecture through formal econometric tests based on intra-daily data from January 4, 2011 to September 30, 2013. This section first applies structural break tests to explore when the stock price and the yen-dollar rate in daytime and in nighttime had structural break(s).

Unlike the Chow test which tests for regime change at a priori known date, we apply two alternative tests where the break date is unknown. One is the Quandt-Andrews test which modified the Chow framework to consider the F-statistic with the largest value over all possible break dates. Andrews (1993) derived the limiting distribution of the related test statistics. Assuming 15% trimming, we use them to identify a single unknown break date and to test the significant level of the structural break. The other is the Bai-Perron test which extended the Quandt-Andrews framework by allowing for multiple unknown breakpoints. Bai and Perron (2003) provided theoretical and computational results. Assuming 15% trimming and allowing error distributions to differ across breaks, we use them to explore multiple unknown break dates and their significance.

To test structural break(s), we estimate the following equations for daytime and nighttime changes in the Nikkei Futures and in the yen-dollar exchange rate respectively.

(1) $\Delta\ln(DS_t) = \text{const.} + a_1 \Delta \ln(DS_{t-1}) + b_1 \Delta\ln(NS_{t-1}) + \Sigma_j d_{1,j}\Delta\ln(X^j_t) + e_{1,j}\Delta Y_t,$

(2) $\Delta\ln(NS_t) = \text{const.} + a_2 \Delta\ln(DS_t) + b_2 \Delta\ln(NS_{t-1}) + \Sigma_j d_{2,j} \Delta\ln(X^j_t) + e_{2,j}\Delta Y_t,$

(3) $\Delta\ln(DE_t) = \text{const.} + a_3 \Delta\ln(DE_{t-1}) + b_3 \Delta\ln(NE_{t-1}) + \Sigma_j d_{3,j} \Delta\ln(X^j_t) + e_{3,j} Y_t + \Sigma_j f_{3,j} \Delta\ln(Z^j_t),$

(4) $\Delta\ln(NE_t) = \text{const.} + a_4 \Delta\ln(DE_t) + b_4 \Delta\ln(NE_{t-1}) + \Sigma_j d_{4,j} \Delta\ln(X^j_t) + e_{4,j} Y_t + \Sigma_j f_{4,j} \Delta\ln(Z^j_t),$

where $\Delta\ln(DS_t) \equiv$ logged difference of Nikkei 225 Futures from 6:15am to 3:15pm, $\Delta\ln(NS_t) \equiv$ logged difference of Nikkei 225 Futures from 3:15pm to 6:15am in the next day, $\Delta\ln(DE_t) \equiv$ logged difference of the yen-dollar rate from 9am to 5pm, and $\Delta\ln(NE_t) \equiv$ logged difference of the yen-dollar rate from 5pm to 9am in the next day.

Equations (1) – (4) suggest that changes in the Nikkei 225 Futures and in the yen-dollar exchange rate depend on the constant term, their lag dependent variables, and three types of exogenous variables: $\Delta\ln(X^j_t)$, ΔY_t, and $\Delta\ln(Z^j_t)$. The first type of exogenous variable $\Delta\ln(X^j_t)$ is a daily return in the stock price index outside Japan. We use the latest return of NY Dow, that of FT100 in London, and that of Hang Seng index in Hong Kong for $\Delta\ln(X^j_t)$. The second type of exogenous variable ΔY_t is a daily change of US government bond yield. We use the latest yield change of 5-year US government bond. The third type of exogenous variable $\Delta\ln(Z^j_t)$, which is included only for equations (3) and (4), is a daily growth rate of euro-dollar exchange rate. We use the latest change of euro-dollar exchange rate in Japan daytime and that in Japan nighttime.

Table 4 summarizes the results of the Quandt-Andrews test. It reports the results not only for the case where all relevant explanatory variables were included but also for the case where only the constant term was included as an explanatory variable. In equations (2) and (4) which explored determinants of nighttime change, its LR and Wald F-statistic detected a significant structural break except for the case where only the constant term was included in equation (4). In case of Nikkei 225 Futures, the detected break date in its nighttime change was November 15, 2012 when only the constant term was included and was December 31, 2012 when all relevant variables were included. In case of the yen-dollar rate, it was December 28, 2012 when all relevant variables were included. All of the detected structural break dates coincide with the dates when Abenomics started.

Even in equations (1) and (3) which explored determinants of daytime change, its LR and Wald F-statistic detected a significant structural break when we included all relevant variables. But the detected break date was January 24, 2013 in equation (2) and was March 25, 2013 in equation (3), both of which suggest a structural change some months after Abenomics started. More interestingly, its LR and Wald F-statistic could detect a significant structural break neither in (1) nor in (3) when we only included the constant term. This suggests that the beginning of Abnomics caused no significant structural break in daytime changes of the Nikkei 225 Futures and of the yen-dollar exchange rate.

Table 5 summarizes the results of the Bai-Perron test. In case of the Nikkei 225 futures, the test statistics identified December 31, 2012 as the only break point in equations (2) at 1% significance level. But it detected no break point in equation (1) even at 10% significance level. This implies that Abenomics caused a structural break changes in the Nikkei 225 futures only in Japan nighttime. The result is essentially similar in the yen-dollar rate. Unlike in the Nikkei 225 futures, the test statistics identified both January 16, 2012 and December 28, 2012 as break points in equations (4) at 1% significance level. This suggests that there was a structural break before Abenomics. But it also suggests that Abenomics also caused another significant structural break in the nighttime yen-dollar rate change. In contrast, the test statistics identified no break point in equation (4) at 5% significance level, although it identified two structural breaks at 10% significance level. Abenomics caused no clear-cut structural break in the daytime yen-dollar rate change.

V. Event Study Based on Intra-daily Data

In the last section, we implemented structural break tests and found that the structural break dates were asymmetric across daytime and nighttime investors. In this section, we test the existence of asymmetric responses by event studies based on intra-daily data. In the event studies, we assume that the estimation window is from January 5, 2012 to November 9, 2012. By using Nikkei 225 Futures and the yen-dollar rate, we estimate equations (1) - (4) for the estimation window. Using the estimated parameters, we then calculate abnormal return through subtracting forecasted return from actual return after November 13, 2012.

The estimation window is from Nov. 13, 2012 to Sep. 30, 2013. For the estimation window, we regress each abnormal return on the four types of news shocks as follows:

$$(5)\quad AR(DSP_t) = \Sigma_k\, \alpha_{1,k}\, D1k_t + \Sigma_k\, \beta_{1,k}\, D2k_t + \Sigma_k\, \gamma_{1,k}\, D3k_t + \Sigma_k\, \delta_{1,k}\, D4k_t,$$

$$(6)\quad AR(NSP_t) = \Sigma_k\, \alpha_{2,k}\, D1k_t + \Sigma_k\, \beta_{2,k}\, D2k_t + \Sigma_k\, \gamma_{2,k}\, D3k_t + \Sigma_k\, \delta_{2,k}\, D4k_t,$$

$$(7)\quad AR(DEX_t) = \Sigma_k\, \alpha_{3,k}\, D1k_t + \Sigma_k\, \beta_{3,k}\, D2k_t + \Sigma_k\, \gamma_{3,k}\, D3k_t + \Sigma_k\, \delta_{3,k}\, D4k_t,$$

$$(8)\quad AR(NEX_t) = \Sigma_k\, \alpha_{4,k}\, D1k_t + \Sigma_k\, \beta_{4,k}\, D2k_t + \Sigma_k\, \gamma_{4,k}\, D3k_t + \Sigma_k\, \delta_{4,k}\, D4k_t,$$

where $AR(DSP_t)$ = abnormal return of daytime change in Nikkei 225 Futures, $\Delta\ln(NS_t)$ = abnormal return of nighttime change in Nikkei 225 Futures, $\Delta\ln(DE_t)$ = abnormal return of daytime change in the yen-dollar rate, and $\Delta\ln(NE_t)$ = abnormal return of nighttime change in the yen-dollar rate.

The above equations examine how various news shocks affected abnormal return of the stock price and exchange rate in daytime and in nighttime. In the analysis, we consider four types of news: news on monetary policy ($D1k$), news on fiscal policy ($D2k$), news on Abe's growth strategies ($D3k$), and news on the elections which led the Abe's party to the dominant party in the lower and the upper houses of parliament ($D4k$). The list of each type of news shocks was summarized in Table 6. For each news shock, we include a dummy variable which takes one for its event widow and zero otherwise.

The four dummies on monetary policy are those for BOJ's "Statement on Monetary Policy". *D12* and *D12* are dummies when Mr. Shirakawa was BOJ Governor, while *D13* and *D14* are those after Mr. Kuroda became BOJ Governor. In particular, *D13* is the dummy for Governor

Kuroda 's first “Statement on Monetary Policy” which introduced the "Quantitative and Qualitative Monetary Easing" and committed to achieve 2% inflation target in 2 years.

The news dummies on fiscal policy consist of three dummies. *D21* is a dummy for Abe Cabinet’s first announcement which explained principle of its new policy and fiscal expenditure. *D22* is a dummy for the due day until which each ministry had requested additional fiscal allocation. *D23* is a dummy for Abe Cabinet’s first formal announcement on the amount of increased fiscal expenditure.

The news dummies on Abe’s growth strategies consist of two dummies. *D31* is a dummy for Abe Cabinet’s first formal announcement on "Emergency Economic Measures for The Revitalization of the Japanese Economy" in January 2013. It clarified three priority areas Abe’s growth strategies targeted. *D32* is a dummy for Abe Cabinet’s announcement on "Basic Policies for Economic and Fiscal Management and Reform - Ending Deflation and Revitalizing the Economy -" in June 2013. It announced Abe’s another important growth strategies named as "Japan Revitalization Strategy - JAPAN is BACK -".

The news dummies on elections consist of two dummies. The first news dummy ($D41$) is a dummy for the day when the former Prime Minister Noda declared to dissolve the lower house. On the day after the Noda’s declaration, Mr. Abe who was a leader of the LDP (the Liberal Democratic Party) announced his new policy to overcome deflation and to adopt unlimited monetary expansion. Since the LDP was expected to win the election, we can regard it as the first news on Abenomics. The second news dummy ($D42$) is a dummy for the election day of the upper house. After the election, the LDP dominated both the upper and lower houses.

Each dummy variable takes one for its event widow and zero otherwise. When time T is the event day, we assume that the event window is from T to T+5 for news dummies on monetary policy. This reflects the fact that secrecy of BOJ’s decision is high before the announcement. In contrast, the event window is from T-1 to T+5 for *D21*, two news dummies on Abe’s growth strategies, and those on elections. This event window allows for the fact that some information about the event may have leaked out beforehand, and sometimes it takes time for the market to fully react to an event. Moreover, since a lot of news on fiscal policy tended to be revealed before the formal announcements, we assume that its event window is from T-3 to T+5 for news dummies on fiscal policy except for *D21*.

VI. Estimation Results

(1) The Estimation Results of Nikkei 225 Futures

We estimated equations (5) and (6) through splitting the estimation window into the two sub-estimation windows: from Nov. 13, 2012 to May 22, 2013 and from May 23, 2013 to Sep. 30, 2013. Splitting the estimation window into two subsamples reflects the fact that there was a market crash on May 23, 2013 after which the first-stage upward trend of asset prices under Abenomics disappeared. Table 7 reports the estimation results for each subsample. Some of the coefficients took the same sign in the two time zones. However, in the first-subsample, the sign and the significance level of the estimated coefficients were remarkably different between the two time zones. In particular, except for dummies for the third arrow, many of the news shocks tend to be positive and more statistically significant in nighttime than in daytime in the first subsample.

Regarding the news shocks on monetary policy, *D13* (the first statement by new BOJ Governor Kuroda) was significantly positive only in nighttime. Noting that the news shock was revealed in daytime, this implies that nighttime investors reacted to the news shocks which daytime investors had not reacted. The news shocks on fiscal policy, all of which were revealed at the beginning of Abenomics, had larger positive impacts in nighttime than in daytime. In particular, *D21* and *D22* were significantly positive only in nighttime, while *D22* and *D23* were significantly negative only in daytime. Only nighttime investors showed positive responses to the news shocks on fiscal expansion which were revealed in daytime.

As for the election news shock, we can observe significant rises in the stock prices only in nighttime on the day when Prime Minister Noda decided to dissolve the lower house (*D41*). Given the fact that the LDP led by Mr. Abe was expected to win the election, this implies that only nighttime investors showed a significantly positive reaction to the news that the Abe's party would dominate the lower house. In contrast, the news shock on growth strategies tended to be significantly positive only in daytime; *D31* was significantly positive only in daytime. The daytime investors may evaluate Abe's structural reforms rather than expansionary monetary and fiscal policies.

In contrast, all of the three news shocks took the same sign for the two time zones in the second subsample period. Specifically, *D13* was negative in both time zones, although it was

significant only in nighttime. In case of the BOJ's "Statement on Monetary Policy" after May, 2013, there were ex-ante market expectations that the BOJ would adopt additional expansionary policy. But the statement denied the additional policy. The negative coefficients may reflect disappointments of the market for the statement. Similarly, stock prices declined on the election day of the upper house (*D42*) both in daytime and in nighttime. In contrast, the dummy on growth strategies *D32* was positive in both time zones, although neither of them was significant. After the market crash on May 23, 2013, the investors might have come to focus on Abe's structural reforms rather than monetary and fiscal policies.

(2) The Estimation Results of Yen-Dollar Rates

We estimated equations (7) and (8) for two estimation windows: from Nov. 13, 2012 to May 22, 2013 and from May 23, 2013 to Sep. 30, 2013. Table 8 reports the estimation results for each subsample. In the first subsample, we can still observe different features across the two time zones. That is, many of news shocks were more significantly positive in nighttime than in daytime, which implies that news on Abenomics tended to make the yen-dollar rates depreciate in nighttime.

Regarding the news shocks on monetary policy, *D13* (the first statement by new BOJ Governor Kuroda) was significantly positive both in daytime and in nighttime. But *D11* was significantly positive only in nighttime. At least before late May 2013, monetary policy tended to make the yen-dollar exchange rates depreciate in nighttime.

The results on the other news shocks were less clear because most of the estimated coefficients were not significant. But *D23* (the first formal announcement on the amount of fiscal expenditure) was significantly negative only in daytime, while *D31* (the news shocks on growth strategies announced in January 2013) was significantly positive only in nighttime. When Abe's growth strategies were announced, the exchange rates tended to depreciate in nighttime at the beginning of Abenomics.

However, as in the Nikkei 225 Futures, we could not observe distinct features between the two time zones in the second subsample period. *D14* was significantly negative both in daytime and in nighttime. Similarly, *D31* (the election day of the upper house) was negative both in daytime and in nighttime. In contrast, *D32* was significantly positive both in daytime and in

nighttime, although it was significant only in daytime. After the market crash on May 23, 2013, only Abe's growth strategies tended to cause yen's depreciate in bot time zones.

VI. Concluding Remarks

The Japanese economy had experienced prolonged deflation since the late 1990s. In order to 'reflate' its economy, Abenomics implemented quantitative easing, fiscal policy through expanding government spending, and provide economic growth strategies. Both the stock market and the foreign exchange market reacted to the new policy regime very favorably at least before the market crash on May 23, 2013. But there was conspicuous asymmetric behavior between local and foreign investors under the new regime. In this paper, we explored who reacted to Abenomics favorably and when it happened.

We found that foreign investors' responses to the new regime played a leading role in improving the market sentiments. In particular, we found that most of the news shocks on Abenomics had a significant effect only on nighttime changes even if they were revealed in daytime. Noting that foreign investors tend to trade in Japan nighttime, it suggests that the dramatic market responses under Abenomics happened only in time zones when foreign investors were active.

It is beyond scope of this paper to see why there were asymmetric responses between local and foreign investors. We may attribute them to asymmetric risk tolerance or asymmetric information across investors. Overconfidence by foreign investors and pessimistic views by local investors may explain the asymmetry. Although we need further data and evidence, it will be an important research agenda to see why only foreign investors reacted to Abenomics favorably. However, the asymmetry might have been less significant after the market crash on May 23, 2013.

References

Andrews, D.W K, (1993), "Tests for Parameter Instability and Structural Change with Unknown Change Point," Econometrica, vol. 61(4), pp.821-56.

Bai, J., and P. Perron, (2003), "Computation and Analysis of Multiple Structural Change Models", Journal of Applied Econometrics, vol. 18, pp.1-22.

Bernanke, B.S., V. R. Reinhart, and B. P. Sack, (2004), "Monetary Policy Alternatives at the Zero Bound: An Empirical Assessment," Brookings Papers on Economic Activity, no. 2 (Fall 2004), pp. 1-78.

Fukuda, S., (2012) Market-specific and Currency-specific Risk during the Global Financial Crisis: Evidence from the Interbank Markets in Tokyo and London, Journal of Banking and Finance, 36(12), 3185-3196.

Honda, Y., Y. Kuroki, and M. Tachibana, (2007), "An Injection of Base Money at Zero Interest Rates: Empirical Evidence from the Japanese Experience 2001-2006," Osaka University, Discussion Papers in Economics and Business, No.07-08.

Kohn, D., and B. Sack, (2003), "Central Bank Talk: Does It Matter and Why?" Board of Governors of the Federal Reserve System, Finance and Economics Discussion Series, 2003-55.

Krugman, P., (2013), "Japan Steps Out," New York Times, January 13, 2013.

IMF, (2013), "Japan: 2013 Article IV Consultation," IMF Country Report No. 13/253, August 5, 2013.

Ito, T., and V.V. Roley, (1987) News from the U.S. and Japan: Which moves the yen/dollar exchange rate? Journal of Monetary Economics, Volume 19, Issue 2, Pages 255–277.

Tsutsui, Y., and K. Hirayama, (2010), How Fast Do Tokyo and New York Stock Exchanges Respond to Each Other? An Analysis with High-Frequency Data, Japanese Economic Review, 61, iss. 2, pp. 175-201.

Ueda, K., (2012), "Deleveraging and Monetary Policy: Japan since the 1990s and the United States since 2007," Journal of Economic Perspectives, vol. 26(3), pp. 177-202.

Ueda, K., (2013), "The Response of Asset Prices to Abenomics: Is It a Case of Self-Fulfilling Expectations?" CIRJE F-Series CIRJE-F-885, University of Tokyo.

Table 1. Correlation between Net Purchases and Asset Price Changes

(1) Foreign investors

	stock price	exchange rate
Jan. 12 – Dec. 13	0.632	0.520
Jan. 12 – Oct. 12	0.623	0.399
Nov. 12 – Dec. 13	0.682	0.554
Dec. 12 – May. 13	0.779	0.683

(2) Local institutions

	stock price	exchange rate
Jan. 12 – Dec. 13	−0.286	−0.265
Jan. 12 – Oct. 12	−0.171	−0.229
Nov. 12 – Dec. 13	−0.276	−0.234
Dec. 12 – May. 13	−0.335	−0.234

(3) Local individuals

	stock price	exchange rate
Jan. 12 – Dec. 13	−0.710	−0.473
Jan. 12 – Oct. 12	−0.788	−0.297
Nov. 12 – Dec. 13	−0.710	−0.507
Dec. 12 – May. 13	−0.811	−0.638

Table 2. Basic Statistics of Intra-daily Changes of Nikkei 225

(1) Nikkei 225 Futures

	average		standard deviation	
	9am-3:15pm	3:15pm-6:15am	9am-3:15pm	3:15pm-6:15am
full sample	-2.957	8.606	130.472	107.799
before Nov. 30, 2012	-3.080	0.897	86.846	82.368
after Dec. 3, 2012	-2.672	26.520	197.984	149.950
after April 4, 2013	-4.758	13.669	234.705	166.156

(2) Nikkei 225

	average		standard deviation	
	9:15am-3pm	3pm-9:15am	9:15am-3pm	3pm-9:15am
full sample	-2.778	9.031	109.603	117.909
before Nov. 30, 2012	-2.999	1.348	66.000	94.027
after Dec. 3, 2012	-2.259	27.060	173.466	159.426
after April 4, 2013	-0.745	17.906	210.993	182.883

Table 3. Basic Statistics of Intra-daily Changes of Yen-dollar Exchange Rates

	average			standard deviation		
	9am-5pm	5pm-9am	5pm-7am	9am-5pm	5pm-9am	5pm-7am
full sample	-0.015	0.039	0.001	0.357	0.466	0.401
before Nov. 30, 2012	-0.019	0.021	-0.005	0.304	0.334	0.307
after Dec. 3, 2012	-0.006	0.081	0.016	0.459	0.679	0.564
after April 4, 2013	0.034	0.002	-0.041	0.534	0.708	0.582

Table 4. The Quandt-Andrews Test

(1) Nikkei 225 Futures

Daytime Changes

With all explanatory variables

Statistic	Value	Prob.
Maximum LR F-statistic (1/24/2013)	3.931390	0.0067
Maximum Wald F-statistic (1/24/2013)	27.51973	0.0067

Only with the constant term

Statistic	Value	Prob.
Maximum LR F-statistic (8/12/2011)	0.857865	1.0000
Maximum Wald F-statistic (8/12/2011)	0.857865	1.0000

Nighttime Changes

With all explanatory variables

Statistic	Value	Prob.
Maximum LR F-statistic (12/31/2012)	12.98077	0.0000
Maximum Wald F-statistic (12/31/2012)	90.86538	0.0000

Only with the constant term

Statistic	Value	Prob.
Maximum LR F-statistic (11/15/2012)	11.62847	0.0123
Maximum Wald F-statistic (11/15/2012)	11.62847	0.0123

Table 4. The Quandt-Andrews Test (continued)

(2) Yen-dollar exchange rates

Daytime Changes

With all explanatory variables

Statistic	Value	Prob.
Maximum LR F-statistic (3/25/2013)	4.520358	0.0002
Maximum Wald F-statistic (3/25/2013)	40.68322	0.0002

Only with the constant term

Statistic	Value	Prob.
Maximum LR F-statistic (4/03/2013)	2.768635	0.6035
Maximum Wald F-statistic (4/03/2013)	2.768635	0.6035

Nighttime Changes

With all explanatory variables

Statistic	Value	Prob.
Maximum LR F-statistic (12/28/2012)	9.810603	0.0000
Maximum Wald F-statistic (12/28/2012)	88.29543	0.0000

Only with the constant term

Statistic	Value	Prob.
Maximum LR F-statistic (8/10/2011)	6.149050	0.1506
Maximum Wald F-statistic (8/10/2011)	6.149050	0.1506

Table 5. The Bai-Perron Test

(1) Nikkei 225 Futures

Daytime Changes

Break Test	F-statistic	Scaled F-statistic	Critical Value	
0 vs. 1	2.564754	17.95328	19.7	

Nighttime Changes

Break Test	F-statistic	Scaled F-statistic	Critical Value**	
0 vs. 1	8.152923	57.07046	19.7	***
1 vs. 2	3.12388	21.86716	21.79	*
2 vs. 3	7.921402	55.44981	22.87	*
3 vs. 4	1.047018	7.329129	24.06	

Break dates (1% significance level)		
	Sequential	Repartition
1	12/31/2012	12/31/2012

Break dates (10% significance level)		
	Sequential	Repartition
1	12/31/2012	8/09/2011
2	8/09/2011	1/05/2012
3	1/05/2012	12/31/2012

Table 5. The Bai-Perron Test (continued)

(2) Yen-dollar exchange rates

Daytime Changes

Break Test	F-statistic	Scaled F-statistic	Critical Value**	
0 vs. 1	2.615126	23.53613	23.06	*
1 vs. 2	5.290184	47.61166	25.54	*
2 vs. 3	1.193192	10.73873	26.68	

Break dates (10% significance level)

	Sequential	Repartition
1	3/25/2013	4/11/2012
2	4/11/2012	3/26/2013

Nighttime Changes

Break Test	F-statistic	Scaled F-statistic	Critical Value**	
0 vs. 1	7.490063	67.41057	25.65	***
1 vs. 2	4.229503	38.06553	27.66	***
2 vs. 3	1.961774	17.65597	28.91	

Break dates (1% significance level)

	Sequential	Repartition
1	12/28/2012	1/16/2012
2	1/16/2012	4/11/2013

Table 6. The list of each type of news shocks

(1) News shocks on BOJ's monetary policy (the first arrow)

	Date	Contents of the news
D11	2012/12/20	BOJ's Statement on Monetary Policy: Enhancement of Monetary Easing. (Announced at 1:01 p.m.)
D12	2013/1/22	BOJ's Statement on Monetary Policy: The "Price Stability Target" under the Framework for the Conduct of Monetary Policy (Announced at 12:47 p.m.)
D13	2013/4/4	BOJ's Statement on Monetary Policy: Introduction of the "Quantitative and Qualitative Monetary Easing" (Announced at 1:40 p.m.)
D14	2013/6/11	BOJ's Statement on Monetary Policy (Announced at 11:48 a.m.)

(2) News shocks on Japan's fiscal policy (the second arrow)

	Date	Contents of the news
D21	2012/12/26	The first meeting of Abe cabinet: principle of its new policy and fiscal expenditure.
D22	2013/1/7	Deadline of requests from each ministry.
D23	2013/1/15	Announcement by Abe cabinet on the fiscal expenditure of 13.1 billion yen.

(3) News shocks on Japan's growth strategies (the third arrow)

	Date	Contents of the news
D31	2013/1/11	Announcing "Emergency Economic Measures for The Revitalization of the Japanese Economy". Announcement of three priority areas on "Emergency Economic Stimulus Measures".
D32	2013/6/14	Announcement on "Basic Policies for Economic and Fiscal Management and Reform". Announcement on "Japan Revitalization Strategy – JAPAN is BACK –"

(4) News shocks on elections

	Date	Contents of the news
D41	2012/11/14	Declaration by Prime Minister Noda to dissolve the lower house.
D42	2013/7/21	Election day of the upper house.

Table 7. The Estimation Results of Nikkei 225 Futures

(1) Sample period: Nov. 13, 2012 – May 22, 2013

		Daytime Changes			Nighttime Changes		
	Variable	Coef.	t-Stat.		Coef.	t-Stat.	
	D11	-0.163	-0.34		0.524	1.40	
1st arrow	D12	0.162	0.37		-0.231	-0.67	
	D13	0.597	1.42		1.249	3.78	***
	D21	-0.227	-0.51		0.661	1.89	*
2nd arrow	D22	-0.629	-1.67	*	0.593	2.01	**
	D23	-2.209	-2.90	***	0.266	0.44	
3rd arrow	D31	2.319	2.66	***	-0.099	-0.14	
election	D41	0.428	1.10		0.661	2.16	**
R-squared			0.103			0.116	
Durbin-Watson stat			1.711			1.724	

⑵ Sample: May 23, 2013 – Sep. 30, 2013

	Daytime Changes			Nighttime Changes		
Variable	Coef.	t-Stat.		Coef.	t-Stat.	
D14	-0.602	-0.67		-0.836	-1.80	*
D32	1.009	1.22		0.544	1.26	
D42	-1.218	-1.87	*	-0.648	-1.91	*
		0.053			0.066	
son stat		2.114			2.071	

*** = significant at 1% level

** =significant at 5% level

* = significant at 10% level

Table 8. The Estimation Results of Yen-Dollar Rates

(2) Sample period: Nov. 13, 2012 – May 22, 2013

		Daytime Changes			Nighttime Changes		
	Variable	Coef.	t-Stat.		Coef.	t-Stat.	
	D11	-0.096	-0.50		0.476	1.82	*
1st arrow	D12	0.075	0.43		0.219	0.91	
	D13	0.616	3.65	***	0.673	2.91	***
	D21	0.067	0.38		0.135	0.55	
2nd arrow	D22	0.142	0.94		0.017	0.08	
	D23	-0.657	-2.15	**	-0.458	-1.09	
3rd arrow	D31	0.492	1.41		0.950	1.99	**
election	D41	0.170	1.09		0.354	1.65	
R-squared			0.131			0.115	
Durbin-Watson stat			1.904			2.295	

⑵ Sample: May 23, 2013 – Sep. 30, 2013

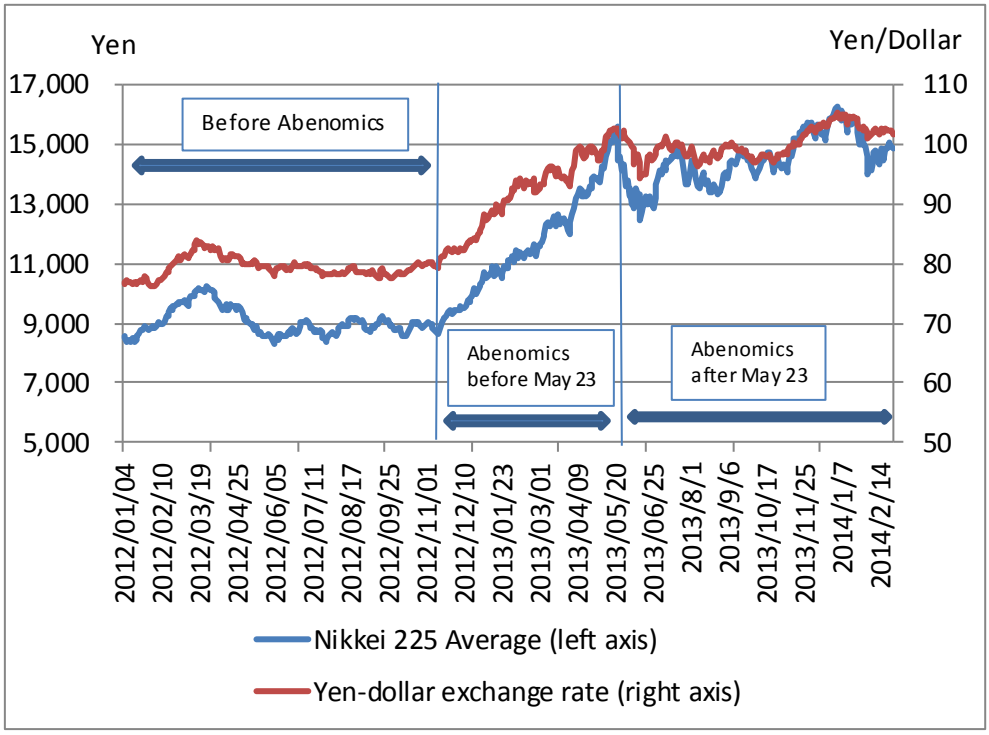
		Daytime Changes			Nighttime Changes		
	Variable	Coef.	t-Stat.		Coef.	t-Stat.	
1st arrow	D14	-0.424	-2.12	**	-0.660	-2.54	**
3rd arrow	D32	0.474	2.57	**	0.375	1.56	
election	D42	-0.173	-1.19		-0.291	-1.54	
R-squared			0.022			0.024	
Durbin-Watson stat			2.088			2.065	

*** = significant at 1% level

** =significant at 5% level

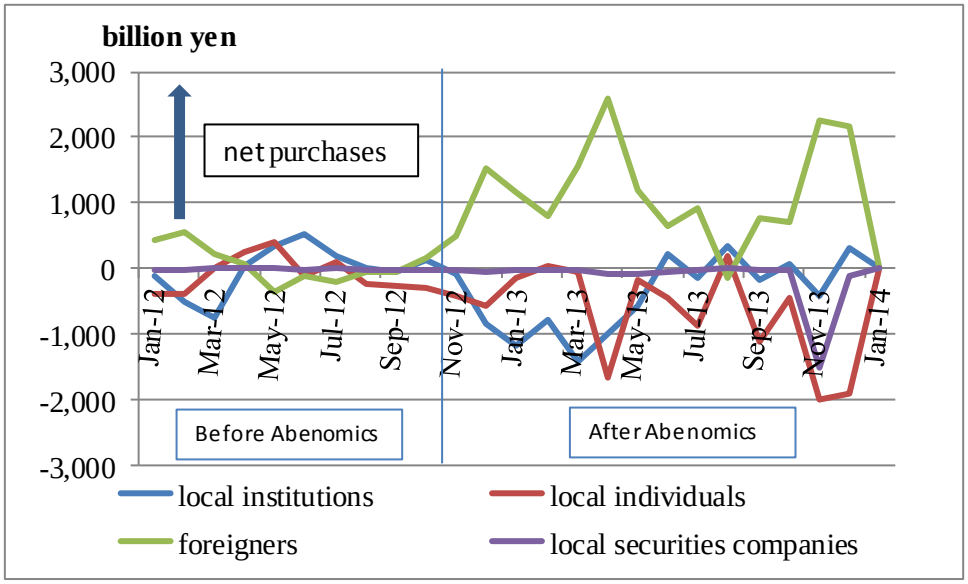
* = significant at 10% level

Figure 1. The Japanese stock price index and the Yen-dollar exchange rates



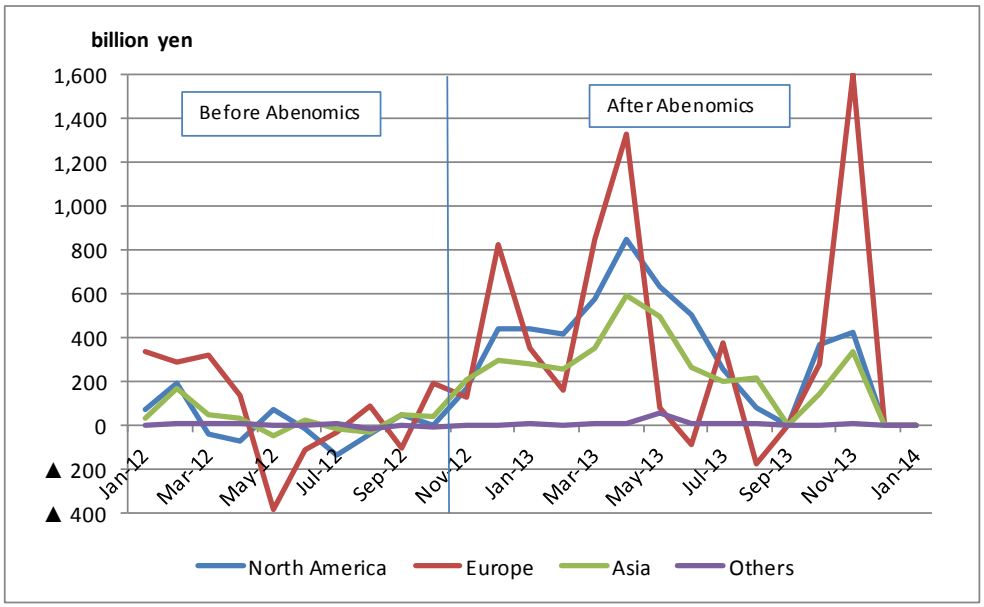
(Source) Nikkei, Financial Quest.

Figure 2. Trading Value by Investor Type TSE 1st Section



(Source) Tokyo Stock Exchange.

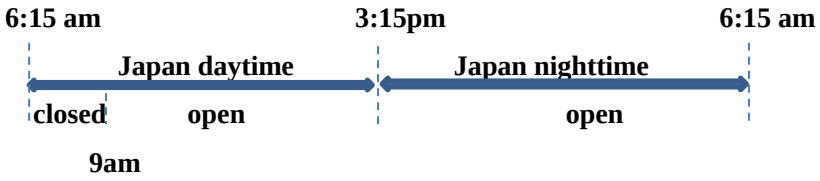
Figure 3. Investments in Listed Stocks by Nonresidential Investors by region



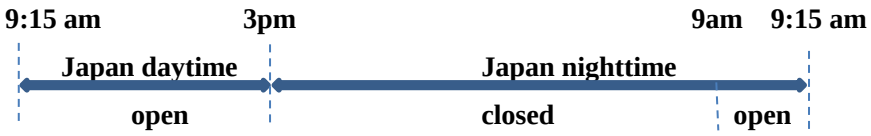
(Source) Tokyo Stock Exchange.

Figure 4. Japan Daytime and Nighttime

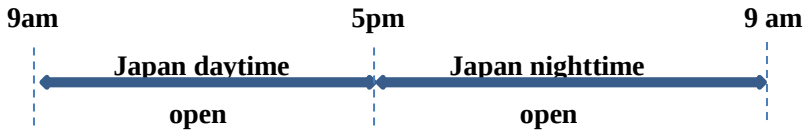
(1) Nikkei 225 Futures



(2) Nikkei 225



(3) The Yen-Dollar Exchange Rates I



(4) The Yen-Dollar Exchange Rates II

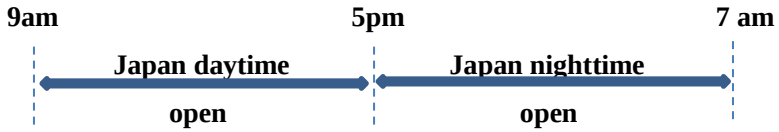
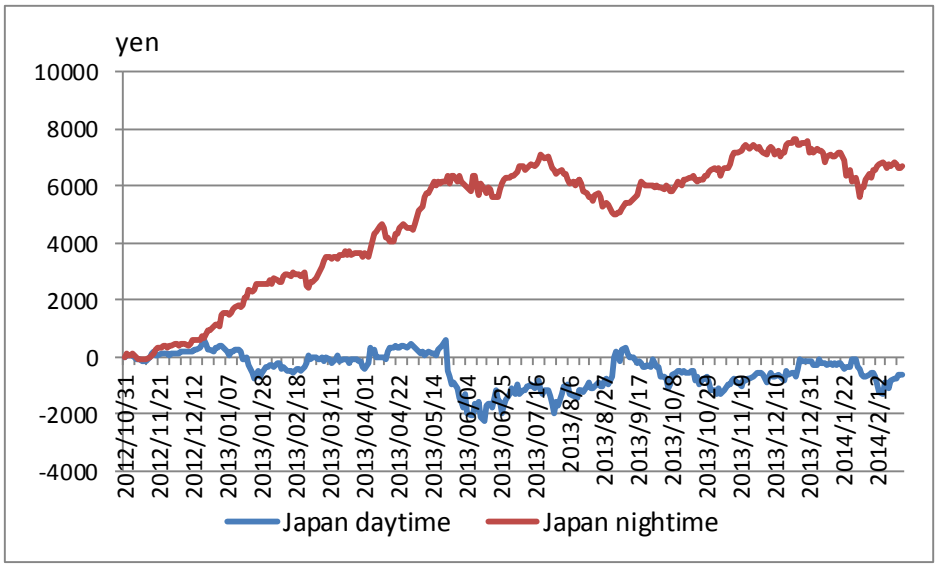
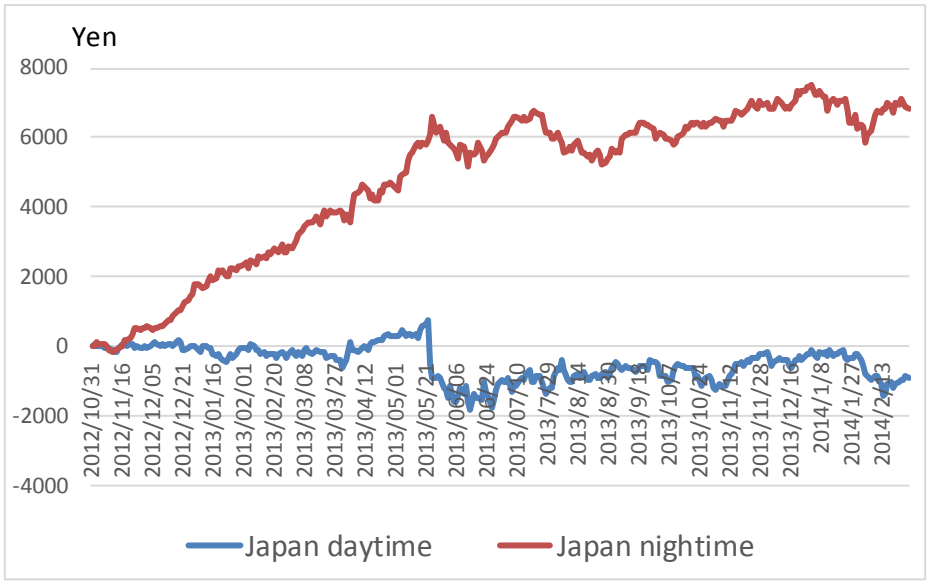


Figure 5. Accumulated Changes of Nikkei 225 (October 31, 2012 = 0)

(1) Nikkei 225 Futures

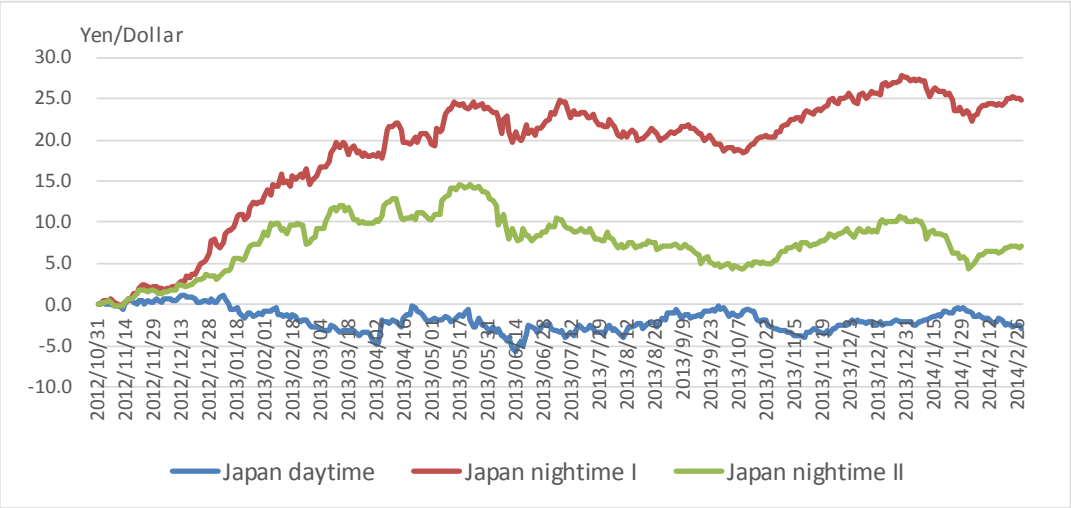


(2) Nikkei 225



(Sources) Nikkei, Financial Quest and Data Stream.

Figure 6. Accumulated Changes of the Yen-Dollar Exchange Rates (October 31, 2012 = 0)



(Source) Nikkei, Financial Quest.