

Effects of Japanese Macroeconomic Announcements on the Dollar/Yen Exchange Rate: High-Resolution Picture*

Yuko Hashimoto* and Takatoshi Ito*

This version November 21, 2008

Preliminary

Abstract:

This paper examines reactions of the yen/dollar exchange rate to macroeconomic statistical announcements using high-frequency data collected from the real trading platform. It investigates the exchange rate returns in reaction to a surprise component of various Japanese macroeconomic announcements. Tankan survey (a short-term business survey conducted by Bank of Japan) and GDP forecast were found to have consistently large impacts on the exchange rate returns. Price indices such as CPI and PPI reports were also found to have significant effects on the returns. On the other hand, Trade Balance announcement had little impact on the returns—which is contrast to findings of the U.S. news release on returns. We also examine the impacts of surprise components of news indicators on transactions. The number of deals increases about 15-30 minutes after the macroeconomic announcements. The transaction responses prominently to Nonfarm Payroll, CPI, Business condition indicators, and partially to Tankan and Retail sales.

JEL: E44, F31, F41, G15

Key Words: Exchange Rate, High-frequency data, market microstructure, macro news announcement

* The authors are grateful to Robert Feldman, Morgan Stanley, for his suggestions and making available the data of macro news announcements and market expectations prior to announcements.

▼ Associate Professor, Toyo University.

* Corresponding author: Professor, University of Tokyo and National Bureau of Economic Research.

1. Introduction

The dynamics of exchange rates is something market participants, economists, and even policymakers are interested in better understanding. Exchange rates are influenced by many variables—not only economic but political. Jumps in exchange rates can be triggered by, for example, comments and formal/informal press releases by politicians and authorities. These changes include both a one-time, temporary jump (which bounces back to the original level after a certain period of time) and a shift to a new level. Nevertheless, these changes are associated with increased transactions in most cases. What triggers the price change and what enhances transactions?

The literature has examined why a particular time of the day tends to be characterized by huge transactions compared to other time of the day. One of the reasons relates a surge of transactions to new information arrivals. The possible existence of private information may cause a different trading response by dealers (informed dealers and uninformed dealers) at the arrival of new information. Then the trading may be intensified between these two types of dealers. Easley and O'Hara (1992) incorporated private information into a model. The other reason is that higher activities can be generated with or without major news. As described in Lyons' (1997) hot potato hypothesis, transactions may be stimulated by a transmission of orders by large retail customers, which in turn generate the high-level of activities.

Under some circumstances, market participants may react to some shocks which triggers transactions that may last for several minutes, if not hours. For example, transactions become very high when dealers begin their workday at proprietary trading rooms in the morning, and retail customers put their orders during the day. Thus, time of the day have natural up and down in activities.¹ Intra-daily patterns have been investigated by Ito and Hashimoto (2006). Market participants also react to a release of public information such as regularly scheduled macroeconomic statistics announcements.

Our paper examines the behavior of exchange rates on days when major Japanese economic statistics, considered to be fundamental determinants of exchange rates, are released. This paper uses high-frequency (one-second-slice) EBS trade-platform data from 2001 to 2005. The EBS represents the majority of spot interbank market of yen/dollar exchange rate. In particular, it examines how the dollar-yen exchange rate market digests various macroeconomic news—to what extent transactions and prices react to the news, how long the news effect lasts, which news has the most/least impact on the exchange rate, and whether there has been a shift in the types of news that affect the exchange rate. In the analysis, the unexpected component of macroeconomic announcements, a “surprise,” is defined by the difference between the actual indicator announcement and the average of predicted indicators by the market.

¹ In general, high foreign exchange transaction volume is caused by asymmetric information and inventory control motives among dealers.

Two key contributions of our paper can be summarized as follows. First, since the data are from the actual trading platform, they are quite reliable even during the very volatile period. This advantage of the EBS data is well-known and exploited by Chaboud et al. (2004) and Berger et al. (2005), Ito and Hashimoto (2006, 2007). The data used in our analysis include both transactable quotes and transaction (deal) prices at every second. Second, to our best knowledge, this is the first paper that analyzes effects of the Japanese macroeconomic announcements on the yen/dollar exchange rate with high frequency trading-platform exchange rate data.

Our findings are as follows. First, some Japanese news releases are found to have particularly large impacts, whereas most others do not on the dollar-yen movements. Large impacts on returns of the dollar-yen were observed in Tankan (Bank of Japan, business survey) and production indices (GDP advance, Diffusion indices). Nonfarm Payrolls and price indices (CPI, PPI) also had impacts on the exchange rate to some extent. However, no statistically significant impacts were observed in trade balance figures (BOP, TB), retail sales, and money supply news. The reason that money supply news announcement turned out to be irrelevant may come from the particular monetary policy—zero interest rate policy with quantitative easing—which was practiced during the sample years. These results contrast to findings in the previous literature that examines the effects of US news releases effects on the exchange rates. Our results parallel with Ehrmann and Fratzscher (2004) in that they find the US news have relatively greater impacts on the exchange rates than the German news announcements.²

The rest of the paper is organized as follows. Section 2 gives a brief literature review. Section 3 describes the Japanese macroeconomic news announcements and the intraday patterns of order flows for each of the news releases. Section 4 summarizes results of econometric estimations of news impacts on returns and the number of transactions. Section 5 concludes the paper.

2. Literature review

Intraday activities such as the number of deals and transaction volume in foreign exchange markets are examined by Chaboud et al. (2004), Berger et al. (2005), and Ito and Hashimoto (2005).³ Baillie

² They infer the results partly due to the news release time; most of the US news announcement are released earlier in a month than the German/Euro Area news announcements.

³ Based on a more recent high frequency data, several stylized facts have been established on intradaily patterns of exchange rates. First, the intra-day seasonality is quite obvious in the number of deals, the number of quote revisions, and bid-ask spread. For example, three peaks in a day are consistently observed for the number of deals and quote revisions: Tokyo opening hours, London opening hours, and New York opening hours. Second, order flows—measured by the number of deals initiated by either buyers or sellers—have significant impacts on the exchange rate. More buyer-initiated deals in a fixed time window—say, one minute—tend to push up the currency in the following several minutes at least, and more seller-initiated deals tend to depreciate the currency. See Chaboud et al. (2004) and Ito and Hashimoto (2004, 2006, 2007).

and Bollerslev (1990) and Andersen and Bollerslev (1997, 1998), for example, show the patterns of intraday price volatility using indicative quotes. Admati and Pfleiderer (1988), Brock and Kleidon (1992), and Hsieh and Kleidon (1996) provided theoretical and empirical background of intraday patterns of the bid-ask spread and volatility.

An examination of news impacts on exchange rates has traced a history of the development of data availability. Ito and Roley (1987) were the first to examine an effect of surprise components of Japanese macroeconomic announcements on the intraday movement of the yen/dollar exchange rate. However, the availability of high-frequency exchange rate data was severely limited at the time, and intraday observations meant five times per day. Once an electrically-recorded exchange rate database became available, many studies have exploited the data. Goodhart and Payne (1996) and Goodhart, Ito and Payne (1996) were among the first to use the Reuter trading platform data (D3000). Andersen and Bollerslev (1998) and Andersen, Bollerslev, Diebold, and Vega (2003) examined the effect of macroeconomic announcements on intradaily exchange markets using the Reuter indicative quote data. Evans and Lyons (2002) and Love and Payne (2003) considered the daily net order flows in foreign exchange markets and studied the relationship between exchange rate of returns and order flows using the Reuters data.

In recent years, the EBS has provided researchers with data which recorded the actual trading platform. Chaboud et al. (2004) examined US macro announcement impacts on the euro-dollar and dollar-yen exchange rates. Their findings are consistent with those in recent literature in that the conditional mean of exchange rates responds very quickly to the unexpected component of news releases. As for the trading volume, they found that news releases increase the volume of transactions. However, they also find a surge in trading volume even if the released news indicators are entirely in line with expectations.

Most of the previous literature that examines news effects on financial markets looked at U.S. and European news announcements. To list a few among many, Fleming and Remolona (1999) looked at the US news announcement effects on the Treasury market; Andersen, Bollerslev, Chaboud et al. (2004), Diebold and Vega (2003, 2005), and Faust et al. (2003) studied US news release and its impact on foreign exchange markets; Ehrmann and Fratzscher (2004) examined U.S. and Germany news releases on the foreign exchange markets. The empirical findings by these studies confirm that U.S. and European news releases have significant effects on pricing of the financial markets.

Analysis of Japanese news announcements on foreign exchange markets, however, needs to date back to Ito and Roley (1987), which used two-spot (opening and closing) exchange rates data. Since then, fewer papers have discussed the effects of Japanese economic announcements on foreign exchange markets. Our paper is in line with the previous literature in that we analyze the effects of unexpected news components on prices and trading volume in exchange rate markets; furthermore, we focus on the Japanese macroeconomic news indicators.

3. Japanese macroeconomic announcements

In contrast to U.S. macroeconomic announcements, most of which coming out at 8:30am (EST), the release time of Japanese news announcements varies from news to news. As summarized in Table 1, some of the macroeconomic announcements are released in the afternoon. Most of the major macroeconomic statistics come out either 8:30am, 8:50am, 10:30am, 2:00pm, or 2:30pm.

The Japanese macroeconomic announcement time has become almost fixed after 2001. Until 2000, a lot of news was released 1hour earlier than the current release time, but some news release was fixed later or went back and forth. For example, it was 2002 when the current CPI release time was set. Release time of three news announcements (Balance of Payments, Trade Balance, and Retail sales) changed once in early 2000 and moved back to the original time about six months later.

We choose these macroeconomic announcements shown in Table 1 so that they parallel to other studies of U.S. and European news effects on foreign exchange markets. For example, Chaboud et al. (2004) used the following US macro variables: Payroll, GDP advanced, PPI, Retail sales, Trade Balance, and Fed Funds Rate (Target). Andersen et al. (2003) used GDP (advance, preliminary, final), Nonfarm Payroll, Retail Sales, Industrial Production, Capacity Utilization, Personal Income, Consumer Credit, Personal Consumption Expenditure, New Home Sales, Durable Goods Orders, Construction Spending, Factory Orders, Business Inventories, Government Budget Deficit, Trade Balance, PPI, CPI, Consumer Confidence Index, NAPM Index, Housing Starts, Index of Leading Indicators, Target Federal Funds Rate, and Money supply. In the European perspectives, Ehrmann and Fratzscher (2004) used GDP, Ifo Business Climate Index, Business confidence balance, PPI, CPI, Retail sales, Trade Balance, M3, Unemployment, Industrial production, and Manufacturing orders as for Germany news releases.⁴

Table 1

Theory predicts that a release of an unexpected content of macroeconomic announcements is followed by a change in deal activities and returns, in contrast to an expected part of announcements that has been already discounted in the exchange rate. This is because market participants react to this unexpected content, a surprise, by rebalancing their positions; that is, the surprise component would stimulate more sell or buy orders—net order flow—in the market, move the direction of exchange rates, and accordingly, result in an increase in price volatility.

In order to check the effect of unexpected content of macroeconomic news releases on deal activities, we compare the number of deals on news-release days and that on no-news days and found that the

⁴ The Ifo Business Climate Index is a closely watched indicator of German business conditions, based on a monthly survey of about 7,000 companies. It is widely seen as a barometer for economic conditions of the Eurozone.

number of deals on news-release days does exceed that on no-news days. However, the magnitude of difference between the number of deals on news-release days and no-announcement days is not that big. Still, transactions on news announcement days tend to become larger at three peaks in a day.⁵ Figure 1 shows the total number of deals on news announcement days and no-announcement days. These are period average of 2001-2005 (for CPI, period average of April 2002- December 2005) at 15-minute window. The top panel of the figure plots the difference between the number of deals on news-announcement days and non-announcement days. Two lines in the bottom panel show the number of deals on news-announcement days and non-announcement days, respectively. That is, the line in the top panels is the difference between two lines in the bottom panel.

Figure 1

As is clear from the figure 1, the difference of the number of transactions between news-announcement days and non-announcement days is remarkable between 9 and 10 am (JST). This time period, the first peak of a transaction pattern in a day, is just after many macro statistics are announced at 8:50am; therefore, this surge of activities may likely reflect the news releases impact and the overnight pent-up demands from retail customers.

In order to distinguish these two effects, we compare the transaction on both news-announcement days and non-announcement days for each of the news indicator release. Figures 2.1-2.8 show the period average of number of deals of news-release days and non-announcement days for each of the news release (either at 8:30am or at 8:50am). Each figure plots the period average of 2001-2005 (for CPI, period average of April 2002-2005) at a 15-minute window from 6am to 12 noon. Figures 2.9-2.12 show the 2001-2005 period averaged number of deals with news releases at either 10:30am, 2:00pm, or 2:30pm, at a 15-minute window. In each figure, the red line shows the benchmark that there was no macro announcement, and the black line shows the deal activities of announcement days (when at least one macro announcement took place.) The top panel shows the difference of number of deals between news-announcement days and non-announcement days, and the bottom panel shows the number of deals of both news-release days and non-announcement days.

A look at each graph reveals that responses of the number of deals to news announcements differ from news to news. News releases such as Tankan, GDPP, and GDPF result in the huge increase in the number of deals around the news announcement time. For example, the number of deals jumps more than 3 times when Tankan indicator is released; the number of deals at the time of GDPP

⁵ Ito and Hashimoto (2006b) show that there are three peaks in a day: about 9-10am (JST), 4-6pm (JST), and 10pm-midnight (JST). They clearly correspond to the Tokyo opening, London opening, and New York opening times, respectively. The last peak corresponds to hours when London and New York business hours overlap. Each of the three troughs, between 2am and 8am (JST), about 12am-1pm (JST), and 8pm (JST), correspond to New York market close, Tokyo lunch time, and London Lunch time, respectively.

releases is about 2.5 times higher than that of no-news days. On average, the number of deals at 15-minute windows doubles on announcement days, and this hike continues about 3 hours. On the other hand, the number of deals on other news releases such as CPI, PPI, Money Supply, TB, and BOP does not seem to be different from that on days when there is no news release.

Figures 2.1-2.8

As for the news releases after 10:30am, the impact of news announcements is not striking compared to that by the early morning (before 9am) news releases such as Tankan, GDPP, and GDPF. In the case of Nonfarm Payroll and Retail Sales announcements, deals were not stimulated by these news releases at all. The increase in the total number of deals failed to surge at the time of, or after the announcement. As for KEIKIP and KEIKIF, the total number of deals became, on average, larger than that on non-announcement day from two hours before the news release until one hour after the announcement—but the difference was very small.

Figures 2.9-2.12

Figures 3.1-3.3 show effects of Monetary Policy Board Meeting (MPM) on transaction. The line shows averaged difference between the total number of deals on MPM days and non-MPM days. Because the closing time of board meetings varies from a meeting to next, time “0” is set as the closing time of the MPM meeting recorded in the minutes and is regarded as the approximate news release time. In figures, the number of deals before and after time 0 is shown. Figure 3.1 shows transactions associated with MPM closing by noon, figure 3.2 shows MPM closing between 12:00pm and 2:30pm, and figure 3.3 shows MPM closing after 2:30pm.

Transactions on days MPM closing before noon did not show any hike at the closing time or about one hour after the meeting. In contrast, as seen in figures 3.2 and 3.3, the total number of deals becomes significantly larger on MPM days than non-MPM days at the closing time in the afternoon, and it continues about one to two hours after the meeting. In particular, the magnitude of an increase in transaction on days MPM closed after 2:30pm is remarkably large.

Figures 3.1-3.3

In summary, the surge in deals around 9:00am (JST) seems relevant to macro news announcements of only Tankan, GDPP, and GDPF. To our surprise, most of the news releases do not significantly increase the transaction volumes. This finding is contrast to the US news impact on FX market where the news releases significantly stimulate the transaction. As for MPM, the board meeting closing in the afternoon had some impact on transaction. This may be due to the fact that London and New York markets as well as Japanese markets have a chance to respond to the result of board meetings. Alternatively, a long MPM meeting may tend to include more surprises than a short one.

4. Impact of surprises on returns

In this section, we examine whether and how much the returns of the dollar-yen exchange rate are affected by the unexpected component of macroeconomic news announcement. When an announcement has an unexpected content, the announcement will be followed by a change in the exchange rate, because investors and market participants react to this unexpected part with a surprise and rebalance their portfolio positions. This portfolio rebalancing through buying/selling actions moves the rate. In sum, the surprise would result in the exchange rate returns—positively or negatively—through changes in the *net* order flow. If there is no surprise (expected=actual indicator announcements), it is expected to have no impact on returns.

We estimate the following regression to analyze the impact of a surprise content of macro economic news:⁶

$$(A-1) \Delta s(t) = \beta_1 N(t) + \varepsilon(t)$$

$$(A-2) \Delta s(t) = \beta_1 N(t) + \beta_2 \Delta s(t-1) + \beta_3 ND(t-1) + \varepsilon(t)$$

where $\Delta s(t)$ is the percentage change in the exchange rate from t to $t+1$, which includes the announcement time. $N(t)$ is the difference between actual announced values and the market-consensus forecast of the announcement. That is, N is interpreted as an unexpected component of the news release. The coefficient of N , the surprise content of the news, is interpreted as the effect of a unit surprise in the data release on the exchange rate returns. β_1 is expected significantly different from zero, but sign of the coefficient could be both + and -. ND is the net *order flow*, defined as the difference between the numbers of ask-side deals and bid-side deals. Regressions are conducted for 1-, 5-, 15-, and 30-minute windows. Sample period is from 2001 to 2005. For the dependent variable of the percentage change in exchange rates, we consider three types of prices: deal price on the ask side, deal price on the bid side, and the middle price of the bid-deal and ask-deal prices.

The OLS estimates of β_1 summarized in Tables 2.1-2.11 reveals mixed results; that is, surprise components of some news have significant effects but other news do not on the returns, regardless of the specification of the regressions. Macro news releases whose unexpected components have significant effects on returns include Tankan, GDPP, and GDPF (on all types of prices), and PPI (on ask-deal price only). On the other hand, news announcements whose unexpected parts have almost no impact on returns include Retail, Trade Balance, KEIKIP, and KEIKIF. For Balance of Payments, CPI, Payroll, Money supply, and PPI (bid-deal and Mid prices), the significance of unexpected parts is mixed.

As for the sign of coefficients, theory predicts the coefficient of N to be negative on the yen/dollar rate for most of the news. That is, any better growth prospects (Tankan, GDPP, GDPF, KEIKIP,

⁶ In Chaboud et al. (2004), the estimation model takes the form of $r=b*s+e$, where r is the return from the one minute before the announcement release to h minutes after the release and s is the unexpected surprise component. The model is estimated only days when there is a news release, not for the whole sample period.

KEIKIF), larger surpluses than expected (TB, BOP), and improved indices (Retail sales, Payroll) should produce an appreciation of the yen, because a positive surprise means the stronger Japanese economy. On the other hand, the sign of coefficients associated with unexpected parts of price indices could be both positive and negative. An unexpected inflation could produce depreciation down the road, but it may prompt a reaction in monetary policy to be tightened so that the yen should appreciate.⁷

The estimation results are consistent with this prediction for Tankan, GDFP, GDPP, BOP, Payroll, PPI, and CPI. Signs of these news releases are significantly negative for most cases.

The significance of coefficients does not vary among the estimation windows. For example, the surprise component of Tankan, GDFP, GDPP, and PPI (deal ask) is significantly negative for all estimation windows, from 1min to 30min. That is, the effects from the surprise last at least 30 minutes for these news releases. Similarly, the surprise coefficients of Retail sales, TB, KEIKIP, and KEIKIF are not significantly different from zero for all estimation windows. For PPI (deal bid and mid prices), BOP, CPI, Money supply and Payroll news releases, the surprise coefficients are mostly significant for 15- and 30-min windows whereas they are not significant for the 1-min window. This could be interpreted as that the surprise component of these news indicators would require about 15 minutes for market participants to digest and to be reflected in price changes.

Tables 2

These findings shed some light on the Japanese news announcement effects on the dollar-yen returns. First, Japanese macro news releases do not always affect the exchange rate returns. Overall, the surprise components related to production index (Tankan, GDPP, GDFP) have significant impact on returns. However, we fail to detect any consistently significant impact from other news releases, such as Retail sales, TB, KEIKIP and KEIKIF. These results are contrast to findings by Chaboud et al. (2004) where they found significant impacts from the surprise component of US news releases on the dollar-yen. Second, the Japanese news impacts on returns, when they exist, are long-lived. The significance lasts at least 15 minutes for most of the cases. These findings are again contrast to Chaboud et al. (2004), where a movement in returns produced by the unexpected component of the US macroeconomic announcements is found to be generally completed within a few minutes. The long-lived effects partly confirm Ito and Hashimoto (2007) in that the price impact on returns remains about 10-15 minutes on average.

5. Impacts on Total number of Deals

Another impact of news surprise arises in the *total* number of deals following macroeconomic announcements. Unlike exchange rate returns, the total number of deals may go up without a surprise, because interpretations of the news may differ among market participants. Unless market participants are homogeneous in expectations on the news—which is very unlikely—some deals are bound to

⁷ The latter reasoning is still relevant in the period of deflation in Japan. Any sign of surprise inflation may be a welcome sign that the Japanese economy would regain normality, ending the quantitative easing sooner than later, resulting in a hike of the policy interest rate from zero.

occur right after the announcement. When there is a surprise component in the news, additional deal activities will be stimulated. Here, we examine the news announcement effects on the number of deals in the following regressions.

$$TD(t) = \alpha_0 + \alpha_1 TD(t-1) + \beta_1 |N(t)| + \beta_2 \{N(t)\}^2 + \varepsilon(t),$$

where $TD(t)$ is the total number of deals in the time window (1-, 5-, 15-, and 30-min) from the news announcement time; $N(t)$ is the unexpected component of the macroeconomic news.

An effect of a surprise on the total number of deals is reflected in the statistical significance of coefficients. As for β_1 , it represents an existence of the magnitude of surprise impact on deal activities; if it is significantly larger than zero, then a magnitude (as measured by an absolute value) of surprise component stimulates transactions. In addition, the bigger the surprise (the gap between the actual and predicted numbers), the more the number of deals. On the other hand, the number of deals is not affected by surprise components if β_1 is not significantly different from zero. As for β_2 , the coefficient significantly larger than zero is interpreted as an accelerating (nonlinear) effect on deals from news surprise—the number of total deals increases more than proportional to the gap between the predicted and actual news announcements.

The results are summarized in Table 3. As for the significance of coefficients, some news announcements have significant impacts on the number of deals while others do not. For example, surprise components of Payroll, KEIKIF, and CPI are reported to have significant in both β_1 and β_2 , and for most of the time windows. Tankan, Retail sales, GDPP, GDPF and BOP are found to have some impacts on the deals. On the other hand, surprise components of KEIKIP, TB, MONEY, and PPI do not have any impacts on the number of deals.

Among three news announcements whose surprise components are significantly estimated, the significance of time-windows varies among these announcements. For example, coefficients of β_1 and β_2 of Payroll are significant for 15min- and 30min- windows. On the contrary, they are not significantly different from zero for 1min- and 5-min windows. This result means that it takes a while (about 15 to 30 minutes) for dealers to digest the surprise component of Payroll announcement. The transaction is affected by the surprise itself and the gap between the actual and predicted numbers. The results are similar for KEIKIF and CPI announcements; in both news announcements, coefficients of β_1 and β_2 are significant for all time windows but for the 1min window.

For these three news announcements of Payroll, KEIKIF, and CPI, the significant coefficients of β_1 and β_2 imply that a surprise component itself increases the number of deals and the larger gap (between actual and predicted numbers) also increases the transaction. In addition, these effects are found to take at least 5 minutes to arise.

The effects of surprise components of other news announcements such as Retail, Tankan, BOP, GDPP, and GDPF vary from one news announcement to another. The coefficients of β_1 and β_2 are significant at 1min window for Retail and at 5min window for Tankan. This means that effects of surprise components on deals last only about 1 minute for these news announcements. For BOP announcement, β_1 and β_2 are significant at 30min, which means the news impact takes at least 30 minutes to arise in the transaction. For GDPP announcement, only β_1 at 15min window is significant.

Therefore, the surprise itself has some impact on deals after 15 minutes of the news release, but the impact is not that large. The transaction is not sensitive to the gap between actual and predicted numbers. For GDPF, β_2 is significant at 15min and 30min windows. This means that the larger gap between actual and predicted numbers is reflected in an increasing number of transaction about 15 to 30 minutes after the news releases.

In sum, the surprise component of some news announcements have significant impacts on the total number of deals; the gap between the actual and predicted numbers of news releases such as Payroll, KEIKIF, and CPI results in increasing the number of transaction in the market. Retail, Tankan, GDPP, and GDPF are also found to have impacts on total number of deals to some extent.

6. Conclusion

In this paper, the dollar-yen exchange rate reactions to surprise components of macroeconomic statistical announcements were examined using the high-frequency deal prices. Returns and transactions around the news release announcement days were compared to non-announcement days controlling for other institutional variable. Tankan and production-related statistics produced statistically significant reactions in returns within 1 – 30 minute windows. Surprisingly, we fail to detect a significant impact on returns from Trade balance statistics and business condition indices. These findings are contrast to the previous study on the US news impact on the dollar-yen exchange rate; a surprise component of the US news significantly affect the returns. However, the surprise impacts are, when they exist, found to be long-lived; which is again contrast to US news impacts on the dollar-yen. As for the effects on the number of transactions, nonfarm payroll, CPI, KeikiF, and GDPF are found to have significant effects on deals, and they are again long-lived. Surprises in Tankan and Retail sales significantly increase the number of deals, but these effects last very short (1min).

Our paper sheds some light on the news impact on the exchange rate. In contrast to the US news announcements, the Japanese news indicators have less impact on returns and the number of transactions. In particular, retail sales, trade balance and money supply statistics are found to have little effect on the dollar-yen exchange rate. The reason that money supply news announcement is irrelevant may be due to the monetary policy—zero interest rate policy with quantitative easing—during the sample years.

Reference

- Admati, Anat R. and Paul Pfleiderer, "A Theory of Intraday Patterns: Volume and Price Variability," *Review of Financial Studies*, (1988), vol. 1, no. 1: 3-40.
- Andersen, Torben G. and Tim Bollerslev (1997). "Intraday Periodicity and Volatility Persistence in Financial Markets," *Journal of Empirical Finance*, vol. 4: 115-158.
- Andersen, Torben G. and Tim Bollerslev (1998). "Deutsche Mark-Dollar Volatility: Intraday Activity Patterns, Macroeconomic Announcements, and Longer Run Dependencies," *Journal of Finance*, Vol. 53, Issue 1, February: 219-265.
- Andersen, Torben G., Tim Bollerslev, Francis X. Diebold, and Clara Vega (2003). "Micro Effects of Macro Announcements: Real-Time Price Discovery in Foreign Exchange," *American Economic Review*, vol. 93: 38-62.
- Andersen, Torben G., Tim Bollerslev, Francis X. Diebold, Clara Vega, 2005, "Real-Time Price Discovery in Stock, Bond and Foreign Exchange Markets", NBER Working Paper No. 11312
- Baillie, Richard T. and Tim Bollerslev (1990). "Intra-Day and Inter-Market Volatility in Foreign Exchange Rates," *Review of Economic Studies*, vol. 58: 565-585.
- Baillie, Richard T. and Michel M. Dacorogna (1997), eds., *High Frequency Data in Finance*, a conference volume *Journal of Empirical Finance* vol. 4, no. 2-3.
- Berger, David, Alain P. Chaboud, Sergey V. Chernenko, Edward Howorka, Raj S. Krishnasami Iyer, David Liu, and Jonathan H. Wright, (2005). "Order flow and Exchange Rate Dynamics in Electronic Brokerage System Data," Board of Governors of the Federal Reserve System International Finance Discussion Papers No.830, April.
- Bollerslev, Tim and I. Domowitz, (1993). "Trading Patterns and Prices in the Interbank Foreign Exchange Market," *Journal of Finance*, vol. 48: 1421-1443.
- Brock, W. A. and A. Kleidon, (1992). "Periodic Market Closure and Trading Volume: A Model of Intraday bids and asks," *Journal of Economic Dynamics and Control*, vol. 16: 451-489.
- Chaboud, Alain P.; Sergey V. Chernenko, Edward Howorka; Raj S. Krishnasami Iyer, David Liu and Jonathan H. Wright, 2004. "The High-Frequency Effects of U.S. Macroeconomic Data Releases on Prices and Trading Activity in the Global Interdealer Foreign Exchange Market," Board of Governors of the Federal Reserve System, International Finance Discussion Papers, Number 823, November.
- Covrig, Vicentiu and Michael Melvin, (2005), "Tokyo Insiders and the Informational Efficiency of the Yen/Dollar Exchange Rate," *International Journal of Finance and Economics*, vol. 10, 185-193.

Dufour, Alfonso and Robert F. Engle, (2000). "Time and the Price Impact of a Trade," *Journal of Finance*, Vol.55, Issue 6, 2467-2498.

Easley, David and Maureen O'Hara, (1992). "Time and the Process of Security Price Adjustment," *Journal of Finance*, vol. XLVII, no.2, June: 577-605.

Ehrmann, Michael, and Marcel Fratzscher, 2004, "Exchange Rates and Fundamentals New Evidence from Real-Time Data" ECB Working Paper Series No. 365, May 2004

Engle, Robert F., Takatoshi Ito, Wen-Ling Lin, 1990, "Meteor Showers or Heat Waves? Heteroskedastic Intra-Daily Volatility in the Foreign Exchange Market", *Econometrica*, Vol. 58, No. 3, pp. 525-542, (May 1990).

Engle, Robert F. and Andrew J. Patton, (2004). "Impacts of Trades in an Error Correction Model of Quote Prices," *Journal of Financial Market*, Vol 7, Issue 1, 1-25.

Faust, Jon; John H. Rogers, Shing-Yi B. Wang, and Jonathan H. Wright, (2003). "The High Frequency Response of Exchange Rates and Interest Rates to Macroeconomic Announcements," Board of Governors of the Federal Reserve System, *International Finance Discussion Papers*, no. 784, October.

Foster, F. Douglas, and S. Viswanathan, (1990). "A Theory of the Interday Variations in Volume, Variance, and Trading Costs in Securities Markets," *Review of Financial Studies*, vol. 3, no.4: 593-624.

Foster, F. Douglas, and S. Viswanathan, (1993). "Variations in Trading Volume, Return Volatility, and Trading Costs: Evidence on Recent Price Formation Models," *Journal of Finance*, 48, 187-211.

Goodhart, Charles; Takatoshi Ito; and Richard Payne, (1996) "One Day in June 1993: A Study of the Working of the Reuters 2000-2 Electronic Foreign Exchange Trading System," in J. A. Frankel, G. Galli, and A. Giovannini (eds.) *The Microstructure of Foreign Exchange Markets*, Chicago: The University of Chicago Press: 107-179.

Goodhart, Charles and Richard Payne, (1996) "Microstructural Dynamics in a Foreign Exchange Electronic Broking System" *Journal of International Money and Finance*, vol. 15, no. 6: 829-852.

Goodhart, Charles, A.E. and Maureen O'Hara, (1997). "High Frequency Data in Financial Markets: Issues and Applications" *Journal of Empirical Finance*, vol. 4: 73-114.

Harris, Larry (1986). "A Transaction Data Survey of Weekly and Intraday Patterns in

Stock Returns," *Journal of Financial Economics*, Vol.16, 99-117.

Hsieh, David, (1988). "The Statistical Properties of Daily Foreign Exchange Rates, 1974-1983," *Journal of International Economics*, vol. 24: 129-145.

Hsieh, David A. and Allan W. Kleidon, (1996). "Bid-Ask Spreads in Foreign Exchange Markets: Implications for Models of Asymmetric Information" in J. A. Frankel, G. Galli, and A. Giovannini (eds.) *The Microstructure of Foreign Exchange Markets*, Chicago: The University of Chicago Press: 41-67.

Ito, Takatoshi and Yuko Hashimoto, (2004). "Microstructure of the Yen/Dollar Foreign Exchange Market: Patterns of Intra-day Activity in the Electronic Broking System" NBER working paper, no. 10856, October 2004.

Ito, Takatoshi and Yuko Hashimoto, (2006). "Intra-day Seasonality in Activities of the Foreign Exchange Markets: Evidence from the Electronic Broking System", *Journal of The Japanese and International Economies*, Vol.20, Issue 4, 637-664, Dec 2006.

Ito, Takatoshi and Yuko Hashimoto (2007, forthcoming). "Price Impacts of Deals and Predictability of the Exchange Rate Movement," in T. Ito and A. Rose (eds.), *International Financial Issues in the Pacific Rim: Global Imbalances, Financial Liberalization, and Exchange Rate Policy*, University of Chicago Press-NBER.

Ito, Takatoshi, Richard K. Lyons, and Michael T. Melvin, (1998). "Is There Private Information in the FX Market? The Tokyo Experiment" *The Journal of Finance*, vol. LIII, no. 3, June: 1111-1130.

Ito, Takatoshi and V. Vance Roley, (1987). "News from the U.S. and Japan: Which Moves the Yen/Dollar Exchange Rate?", *Journal of Monetary Economics*, vol. 19, March: 255-277.

Ito, Takatoshi and V. Vance Roley, 1991, "Intraday Yen/Dollar Exchange Rate Movements: News or Noise?", *Journal of International Financial Markets, Institutions and Money*, Vol. 1, No. 1, pp. 1-31, (1991).

Lyons, Richard (1995). "Tests of Microstructural Hypotheses in the Foreign Exchange Market," *Journal of Financial Economics*, vol. 39: 321-351.

Lyons, Richard (1996). "Foreign Exchange Volume: Sound and Fury Signifying Nothing?" in J. A. Frankel, G. Galli, and A. Giovannini (eds.) *The Microstructure of Foreign Exchange Markets*, Chicago: The University of Chicago Press: 183-205.

Lyons, Richard (1997). "A simultaneous trade model of the foreign exchange hot potato". *Journal of International Economics* 42, 275-2

Lyons, Richard (1998). "Profits and Position Control: A Week of FX dealing" *Journal of International Money and Finance*, vol. 17: 97-115.

Lyons, Richard (2001). *The Microstructure Approach to Exchange Rates*, Cambridge: MIT Press.

Wood, Robert, Thomas McInish, and Keith Ord (1985). "An Investigation of Transaction data on NYSE Stocks," *Journal of Finance*, Vol.40, 723-741.

Figure 1: Transactions on News release days/Non-announcement days

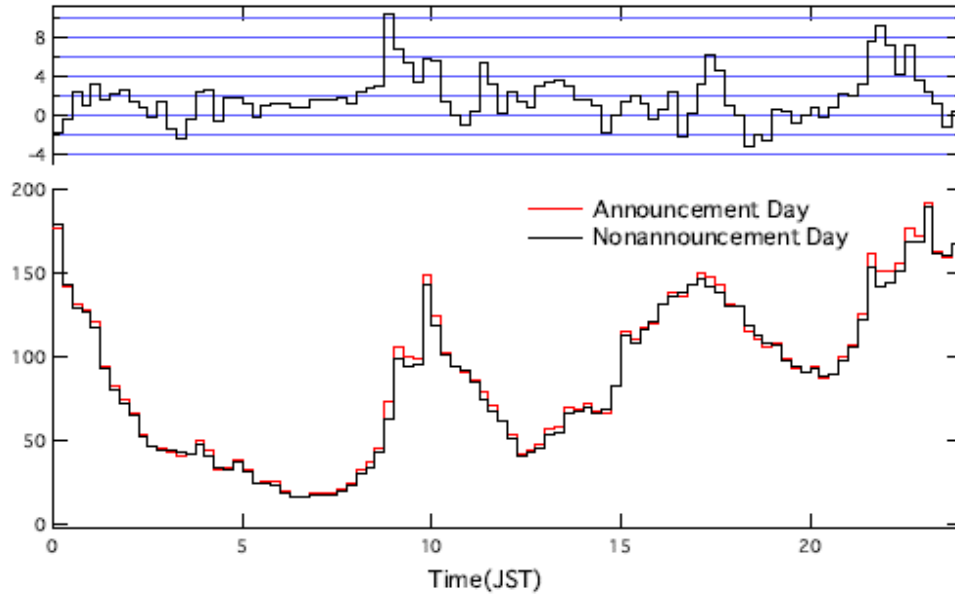


Figure 2.1 Transaction and News Releases (CPI; 8:30am)

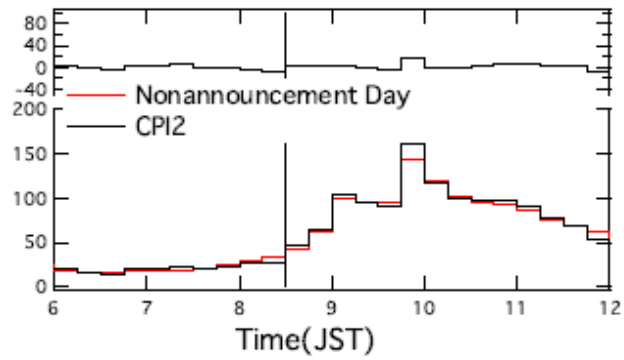


Figure 2.2 Transaction and News Releases (Tankan; 8:50am)

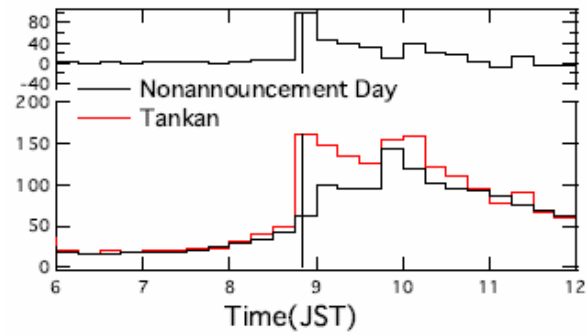


Figure 2.3 Transaction and News Releases (Money Supply; 8:50am)

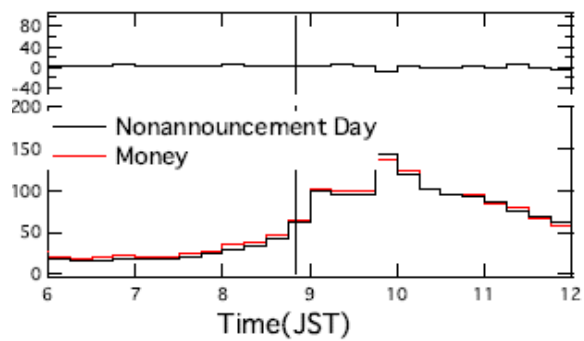


Figure 2.4 Transaction and News Releases (GDPP; 8:50am)

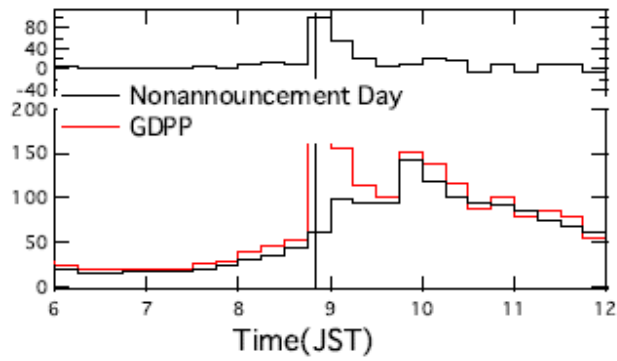


Figure 2.5 Transaction and News Releases (GDPF; 8:50am)

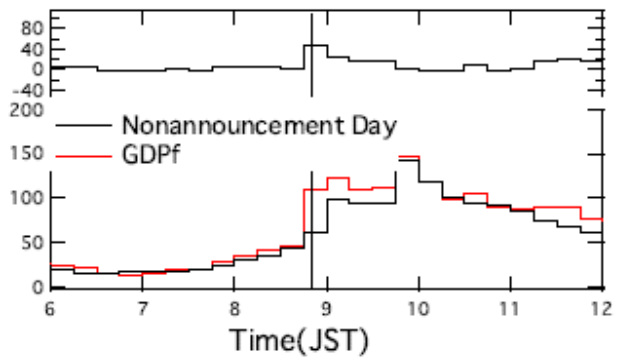


Figure 2.6 Transaction and News Releases (BOP; 8:50am)

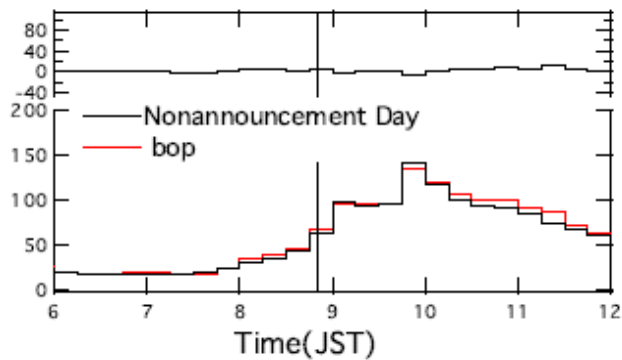


Figure 2.7 Transaction and News Releases (PPI; 8:50am)

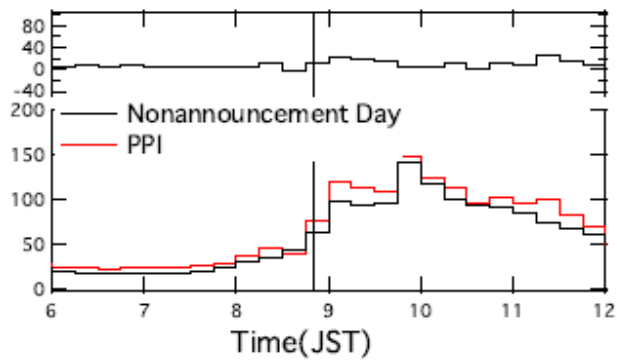


Figure 2.8 Transaction and News Releases (TB; 8:50am)

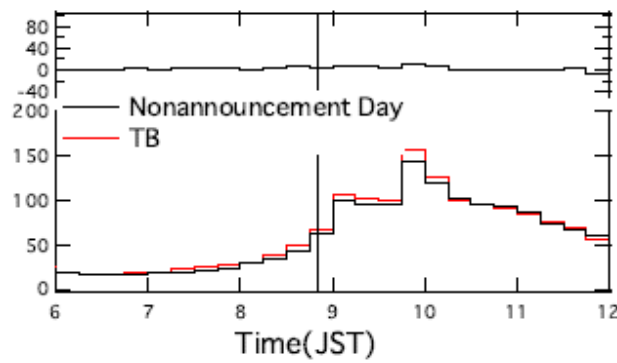


Figure 2.9 Transaction and News Releases (Nonfarm Payroll; 10:30am)

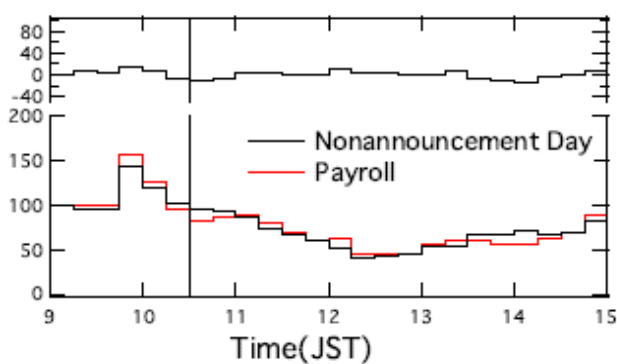


Figure 2.10 Transaction and News Releases (KEIKIP; 2:00pm)

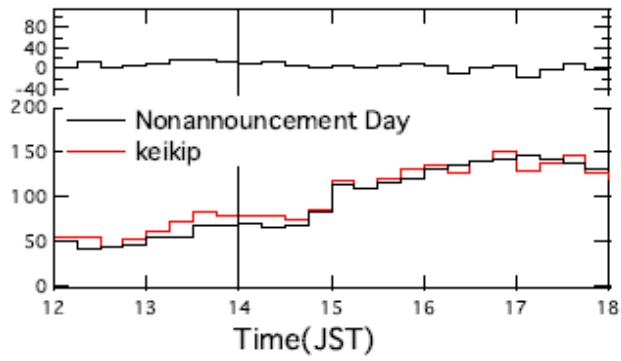


Figure 2.11 Transaction and News Releases (KEIKIF; 2:00pm)

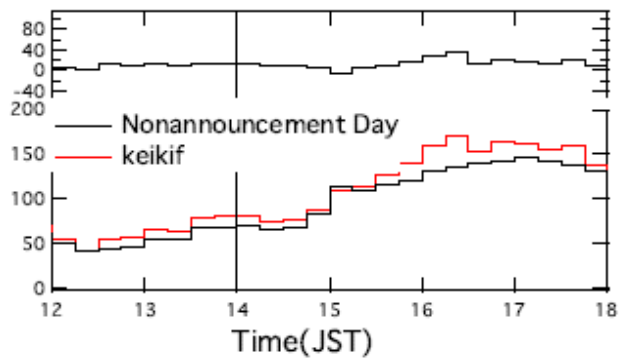


Figure 2.12 Transaction and News Releases (Retail Sales; 2:30pm)

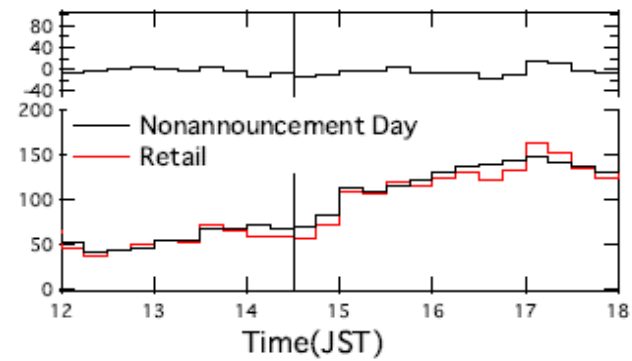


Figure 3.1 Transaction and MPM closing (by noon)

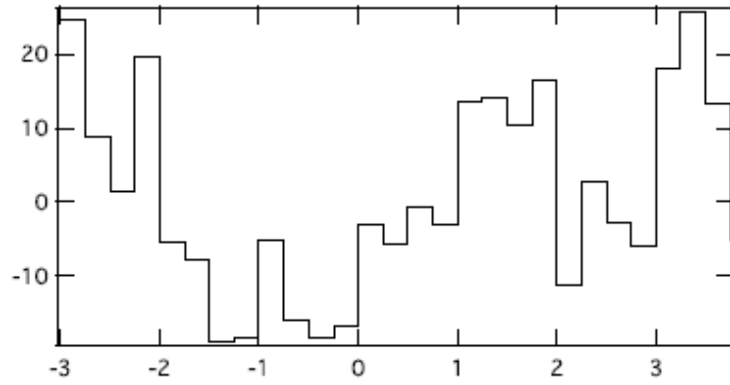


Figure 3.2 Transaction and MPM closing (between 12:00pm and 2:30pm)

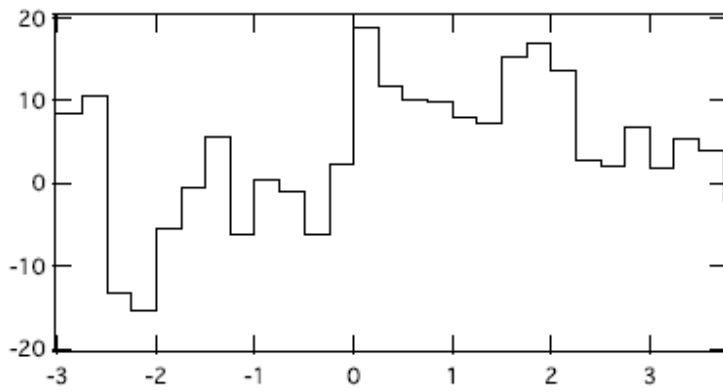


Figure 3.3 Transaction and MPM closing (after 2:30pm)

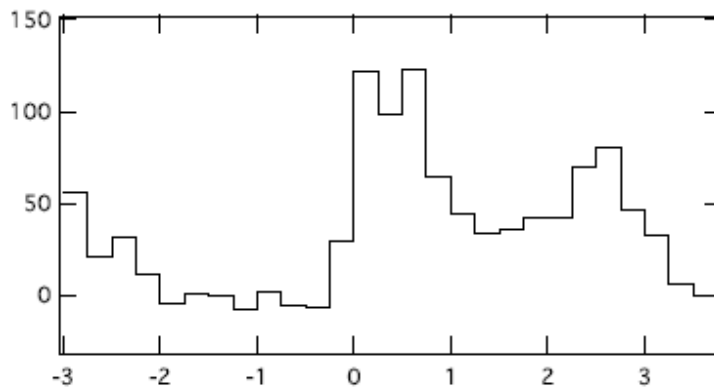


Table 1: Japanese Macroeconomic News Releases

Variable name	Definition	Frequency and Announcement date	Release Time of the day	Corresponding US data: Other studies
Payroll	Nonfarm Payrolls, Preliminary % change from 12 month earlier	Monthly, 1 st wk of the two months later	10:30am	Andersen et al. (2003), Chaboud et al. (2004)
Tankan	Tankan (BOJ short-term business survey of enterprises, Large Manufacturing Index level)	Quarterly, The first week of the month following the quarter (July for Q2), (except mid-December for Q4)	7:50am (until Oct 3, 2000) 8:50am (after Dec 2000)	Ehrmann and Fratzscher(2004); Ifo Business Climate Index:
Money	Money supply, M2+CD (average balance), % change from 12 month earlier	Monthly, 6 th business day of the following month* ¹	7:50am (until Oct 13, 2000) 8:50am (after Nov 2000)	Andersen et al. (2003), Ehrmann and Fratzscher (2004)
GDPP	Real GDP First Preliminary, % quarter-to-quarter change	Quarterly, Mid-month, two months after the last quarter month	7:50am (until Sep 11, 2000) 8:50am	Andersen et al. (2003), Chaboud et al. (2004)
GDPF	Real GDP Second Preliminary, % quarter-to-quarter change	Quarterly, Mid-month, three months after the last quarter month	8:50am	Andersen et al. (2003), Ehrmann and Fratzscher (2004)
BOP	Current Account Surplus, Balance of Payments, Billions of Yen, seasonally adjusted	Monthly, Mid-month, two month later (mid-March for January figure)	7:50am (May 24-Oct 19, 2000) 8:50am	Chaboud et al. (2004)
PPI	Producer Price Index (until Dec 2002 Wholesale Price Index), % change from 12 month earlier	Monthly, Mid-month of the following month	8:50am	Andersen et al. (2003), Chaboud et al. (2004), Ehrmann and Fratzscher (2004)
Retail	Commercial sales index, Retail sales, % month-to-month change	Monthly, last week of the following months	13:30 (April 24-Oct 24, 2000) 14:30	Andersen et al. (2003), Chaboud et al. (2004), Ehrmann and Fratzscher (2004)

TB	Trade balance (customs data), Billions of JPY	Monthly, mid of the following month	7:50am (April 11-Oct 12, 2000) 8:50am	Andersen et al. (2003), Ehrmann and Fratzscher (2004)
CPI	Consumer Price Index (all items excluding fresh food, /nationwide, seasonally adjusted), % month-to-month change	Monthly, Last week of the following month	8:00am (until March 1, 2002) 8:30am	Andersen et al. (2003), Ehrmann and Fratzscher (2004)
KEIKIP	Index of Business Conditions (Leading index), Preliminary, Index level	Monthly, early of the following month	13:00 (until Oct 5, 2000) 14:00	
KEIKIF	Index of Business Conditions (Leading index), Final, Index level	Monthly, mid-late of the following month	14:00	
MPCLOSE	Monetary Policy Board Meeting Close Time (no numerical meaning)	Bi- Monthly, Roughly twice a month (except once a month, August and December).	Approximate closing time of the close of the meeting. Source; Bank of Japan	Chaboud et al.(2004)
*1 Announcement, 10 th business day of the following month from October 1999 through April 2000; 8 th business day of the following month, May and June 2000; 7 th business day of the following month, July-October 2000; and 6 th business day since November 2000.				

Table 2 News Surprise Impact on Returns

Tankan, Deal Ask								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.018 *	-0.016 *	-0.018 **	-0.015 ***	-0.021 **	-0.015 *	-0.018 *	-0.015 ***
	(0.011)	(0.010)	(0.009)	(0.006)	(0.011)	(0.010)	(0.011)	(0.006)
return(-1)					-0.003	-0.902	-0.514	-0.792
					(0.635)	(0.760)	(1.187)	(1.448)
net order flow					-0.039	-0.005	-0.001	-0.001
					(0.033)	(0.006)	(0.006)	(0.001)

Tankan: Deal Bid								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.015 *	-0.014	-0.015 *	-0.011 **	-0.014	0.001	-0.016 *	-0.008 *
	(0.011)	(0.011)	(0.009)	(0.006)	(0.011)	(0.011)	(0.009)	(0.005)
return(-1)					-0.031	-0.893 *	-1.156	-1.013 *
					(0.599)	(0.655)	(0.954)	(0.779)
net order flow					0.018	-0.011 **	-0.005	-0.002 ***
					(0.025)	(0.005)	(0.006)	(0.001)

Tankan: Midprice								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.017 *	-0.014 *	-0.018 **	-0.013 **	-0.018 *	-0.013	-0.017 *	-0.013 *
	(0.011)	(0.010)	(0.009)	(0.006)	(0.012)	(0.011)	(0.010)	(0.006)
return(-1)					0.000	-0.670	-0.252	-0.079
					(0.848)	(0.954)	(1.121)	(1.072)
net order flow					-0.001	0.001	0.001	-0.005
					(0.006)	(0.006)	(0.008)	(0.014)

Retail: Deal Ask								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.002	-0.001	-1.9E-04	-1.3E-04	-0.003	-3.4E-04	-0.001	-1.8E-04
	(2.9E-03)	(2.1E-03)	(1.2E-03)	(5.3E-04)	(2.9E-03)	(2.1E-03)	(1.2E-03)	(5.5E-04)
return(-1)					-0.065	-0.295 **	-0.039	-0.077
					(0.160)	(0.153)	(0.140)	(1.3E-01)
net order flow					-0.005 *	0.001	-0.001 **	-3.0E-04 *
					(3.0E-03)	(2.5E-03)	(4.5E-04)	(2.2E-04)

Retail: Deal Bid								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.003	-0.001	-0.001	-0.001 *	-0.004	-0.001	-0.001	-4.3E-04
	(0.003)	(0.002)	(0.001)	(0.001)	(0.003)	(0.002)	(0.001)	(0.001)
return(-1)					-0.062	-0.365 **	-0.234 **	-0.342 ***
					(0.158)	(0.154)	(0.125)	(0.103)
net order flow					-0.006 **	-0.001	-1.5E-06	-1.9E-04
					(0.003)	(0.003)	(3.9E-04)	(2.0E-04)

Retail: Mid price								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-1.6E-03	-7.2E-04	-3.3E-04	-1.6E-04	-1.4E-03	-5.8E-04	-1.2E-04	-3.8E-04
	(0.003)	(0.002)	(0.001)	(0.001)	(0.003)	(0.002)	(0.001)	(0.001)
return(-1)					-0.056	-0.369 *	-0.335 **	-0.547 ***
					(0.269)	(0.275)	(0.151)	(0.121)
net order flow					3.3E-04	2.7E-05	-1.5E-04	1.6E-03 *
					(0.001)	(0.001)	(0.001)	(0.001)

Table 2 News Surprise Impact on Returns (cont'd)

PPI: Deal Ask								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.477 **	-0.274 **	-0.165 *	-0.166 **	-0.434 **	-0.195 **	-0.057	-0.151 *
	(0.199)	(0.149)	(0.110)	(0.100)	(0.198)	(0.109)	(0.089)	(0.089)
return(-1)					-0.574 *	-0.908 ***	-0.871 ***	-0.989
					(0.336)	(0.232)	(0.192)	(0.789)
net order flow					0.001	0.013 ***	0.003 *	0.002 ***
					(0.014)	(0.003)	(0.002)	(0.001)
PPI: Deal Bid								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.359 **	-0.163	-0.066	-0.048	-0.362 **	-0.164 *	-0.052	-0.039
	(0.179)	(0.125)	(0.084)	(0.068)	(0.186)	(0.122)	(0.083)	(0.067)
return(-1)					-0.051	-0.160	0.039	-0.248
					(0.464)	(0.489)	(0.461)	(0.738)
net order flow					0.006	0.007 **	0.004 **	0.001 **
					(0.022)	(0.003)	(0.002)	(0.001)
PPI: Midprice								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.363 *	-0.172 *	-0.071	-0.063	-0.391 **	-0.154	-0.076	-0.041
	(0.177)	(0.124)	(0.089)	(0.076)	(0.182)	(0.125)	(0.090)	(0.079)
return(-1)					-0.404	0.464	0.146	-1.229
					(0.525)	(0.572)	(0.682)	(1.162)
net order flow					0.002	-0.004 *	-0.005	-5.2E-05
					(0.002)	(0.002)	(0.004)	(0.008)
TB: Deal Ask								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-1.4E-05	-1.5E-05	-2.4E-05	1.0E-05	1.1E-05	-2.1E-05	-2.7E-05	1.1E-05
	(1.0E-04)	(6.4E-05)	(3.7E-05)	(2.2E-05)	(9.9E-05)	(6.4E-05)	(3.7E-05)	(2.2E-05)
return(-1)					-0.341 **	-0.278 **	-0.069	0.463 *
					(0.149)	(0.150)	(0.187)	(0.286)
net order flow					0.013 **	0.001	-0.001	1.8E-04
					(0.007)	(0.003)	(0.001)	(3.4E-04)
TB: Deal Bid								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-1.6E-05	-3.4E-05	-5.5E-06	8.7E-06	-8.8E-07	-2.7E-05	-2.9E-06	1.2E-05
	(1.0E-04)	(6.6E-05)	(3.6E-05)	(1.7E-05)	(1.0E-04)	(6.6E-05)	(3.5E-05)	(1.7E-05)
return(-1)					-0.257 **	-0.353 **	-0.195	0.112
					(0.145)	(0.159)	(0.187)	(0.178)
net order flow					0.009 *	-0.002	-0.001 **	-4.5E-04 *
					(0.007)	(0.003)	(4.9E-04)	(2.8E-04)
TB: Mid price								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-5.8E-06	-1.7E-05	-5.9E-06	1.5E-05	-4.7E-05	-2.1E-05	-6.5E-06	1.6E-05
	(1.0E-04)	(6.3E-05)	(3.4E-05)	(1.8E-05)	(1.0E-04)	(6.3E-05)	(3.5E-05)	(1.8E-05)
return(-1)					0.013	-0.221	-0.196	-0.032
					(0.218)	(0.242)	(0.235)	(0.224)
net order flow					-0.002 *	-2.2E-04	0.001	0.003 **
					(0.001)	(0.001)	(0.001)	(0.002)

Table 2 News Surprise Impact on Returns (cont'd)

BOP: Deal Ask								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-9.7E-05 (7.4E-05)	-9.8E-05 ** (5.6E-05)	-2.9E-05 (2.7E-05)	3.5E-06 (2.0E-05)	-1.0E-04 ** (7.6E-05)	-1.0E-04 ** (5.7E-05)	-3.2E-05 (2.7E-05)	1.3E-05 (1.8E-05)
return(-1)					-0.075 (0.163)	-0.088 (0.155)	0.207 (0.194)	-0.003 (0.176)
net order flow					0.005 (0.008)	0.000 (0.003)	0.001 (0.001)	-0.001 *** (0.000)
BOP: Deal Bid								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-1.0E-04 * (7.2E-05)	-1.1E-04 ** (5.5E-05)	-3.2E-05 (3.0E-05)	-8.6E-06 (2.0E-05)	-9.0E-05 (7.3E-05)	-1.1E-04 ** (5.5E-05)	-3.7E-05 (3.1E-05)	5.6E-06 (1.6E-05)
return(-1)					-0.139 (0.173)	-0.031 (0.153)	0.228 (0.200)	0.012 (0.165)
net order flow					0.011 * (0.007)	-0.004 * (0.003)	2.4E-04 (0.001)	-0.002 *** (2.6E-04)
BOP: Deal Mid								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-1.1E-04 * (7.3E-05)	-1.1E-04 ** (5.6E-05)	-3.9E-05 * (2.8E-05)	-2.6E-06 (1.9E-05)	-1.1E-04 * (7.4E-05)	-1.2E-04 ** (5.7E-05)	-4.3E-05 * (2.9E-05)	-5.7E-06 (2.0E-05)
return(-1)					-0.210 (0.214)	-0.082 (0.242)	0.026 (0.277)	0.073 (0.334)
net order flow					0.001 (0.001)	9.9E-05 (0.001)	0.002 * (0.001)	0.001 (0.002)
CPI: Deal Ask								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.039 (0.145)	-0.213 ** (0.096)	0.012 (0.069)	0.015 (0.031)	-0.036 (0.150)	-0.190 ** (0.095)	0.019 (0.074)	0.030 (0.027)
return(-1)					-0.040 (0.276)	-0.132 (0.256)	-0.117 (0.212)	-0.172 (0.195)
net order flow					0.001 (0.011)	0.007 * (0.004)	0.001 (0.002)	0.001 *** (3.0E-04)
CPI: Deal Bid								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.033 (0.146)	-0.155 * (0.102)	0.061 (0.071)	0.046 * (0.032)	-0.036 (0.148)	-0.164 * (0.106)	0.076 (0.074)	0.056 ** (0.033)
return(-1)					0.047 (0.295)	-0.361 * (0.252)	-0.235 (0.271)	-0.135 (0.221)
net order flow					0.012 (0.014)	-0.003 (0.007)	-0.001 (0.002)	0.001 (0.001)
CPI: Deal Mid								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.056 (0.148)	-0.209 ** (0.093)	0.015 (0.067)	-0.008 (0.031)	-0.046 (0.150)	-0.192 ** (0.095)	0.039 (0.069)	-0.018 (0.032)
return(-1)					-0.295 (0.283)	-0.302 (0.272)	-0.482 * (0.293)	0.412 * (0.298)
net order flow					0.002 (0.002)	0.000 (0.002)	0.002 (0.002)	-0.005 ** (0.003)

Table 2 News Surprise Impact on Returns (cont'd)

GDPF: Deal Ask								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.055	-0.072 **	-0.071 ***	-0.089 ***	-0.052	-0.049 *	-0.089 ***	-0.080 ***
	(0.050)	(0.031)	(0.026)	(0.014)	(0.050)	(0.037)	(0.028)	(0.012)
return(-1)					0.473	-0.082	-1.386 *	-1.376 **
					(0.444)	(0.466)	(0.832)	(0.615)
net order flow					0.023	0.005	-0.001	0.001
					(0.023)	(0.004)	(0.002)	(0.001)
GDPF: Deal Bid								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.055	-0.072 **	-0.068 ***	-0.083 ***	-0.058	-0.086 ***	-0.078 ***	-0.087 ***
	(0.050)	(0.030)	(0.025)	(0.014)	(0.046)	(0.027)	(0.029)	(0.014)
return(-1)					0.649 *	-0.336	-0.699	-1.393
					(0.416)	(0.415)	(0.904)	(1.058)
net order flow					0.036 *	0.009 ***	-4.9E-05	0.001 *
					(0.021)	(0.003)	(0.003)	(0.001)
GDPF: Deal Mid								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.052	-0.069 **	-0.070 ***	-0.086 ***	-0.049	-0.068 *	-0.089 ***	-0.089 ***
	(0.049)	(0.030)	(0.026)	(0.015)	(0.068)	(0.046)	(0.028)	(0.014)
return(-1)					0.395	0.017	-1.898 *	-0.890
					(0.961)	(0.799)	(1.130)	(0.934)
net order flow					-1.6E-04	-1.8E-04	0.008	-0.009
					(0.005)	(0.004)	(0.011)	(0.010)
GDPP: Deal Ask								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.145 ***	-0.158 ***	-0.108 ***	-0.095 ***	-0.141 ***	-0.151 ***	-0.112 ***	-0.084 ***
	(0.036)	(0.042)	(0.022)	(0.016)	(0.035)	(0.046)	(0.022)	(0.019)
return(-1)					-0.962 *	-0.297	-0.950	-1.068
					(0.590)	(1.116)	(0.715)	(1.375)
net order flow					-0.023	0.008	-1.2E-04	4.7E-04
					(0.018)	(0.009)	(0.004)	(0.001)
GDPP: Deal Bid								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.140 ***	-0.155 ***	-0.103 ***	-0.098 ***	-0.161 ***	-0.167 ***	-0.112 ***	-0.095 ***
	(0.036)	(0.041)	(0.022)	(0.017)	(0.046)	(0.045)	(0.023)	(0.018)
return(-1)					-0.376	-0.223	-1.373	-0.715
					(0.636)	(1.122)	(1.048)	(1.209)
net order flow					0.025	0.007	-0.002	2.4E-04
					(0.030)	(0.009)	(0.005)	(0.001)
GDPP: Deal Mid								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.138 ***	-0.151 ***	-0.105 ***	-0.091 ***	-0.126 ***	-0.145 ***	-0.109 ***	-0.091 ***
	(0.035)	(0.042)	(0.022)	(0.017)	(0.034)	(0.051)	(0.025)	(0.018)
return(-1)					-1.301 **	-1.069	-1.253 *	-2.140 *
					(0.706)	(1.273)	(0.733)	(1.242)
net order flow					0.005 *	0.005	0.003	-0.001
					(0.003)	(0.005)	(0.006)	(0.009)

Table 2 News Surprise Impact on Returns (cont'd)

KeikiF: Deal Ask								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-4.4E-04 (0.001)	-0.001 ** (0.001)	-2.8E-04 (3.2E-04)	5.0E-06 (1.3E-04)	-4.7E-04 (0.001)	-0.001 (0.001)	-2.6E-04 (3.3E-04)	-1.4E-05 (1.2E-04)
return(-1)					-0.060 (0.144)	-0.116 (0.141)	0.047 (0.127)	-0.148 ** (0.077)
net order flow					-0.001 (0.004)	-0.003 * (0.002)	-5.4E-05 (4.7E-04)	4.1E-04 ** (1.6E-04)

KeikiF: Deal Bid								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-4.5E-04 (0.001)	-0.001 ** (0.001)	-1.1E-04 (3.0E-04)	-6.6E-05 (1.7E-04)	-4.8E-04 (0.001)	-0.001 (0.001)	-1.1E-04 (3.1E-04)	-7.2E-05 (1.5E-04)
return(-1)					-0.008 (0.140)	-0.086 (0.138)	0.046 (0.123)	-0.312 *** (0.108)
net order flow					0.003 (0.004)	-0.005 * (0.003)	1.1E-04 (4.0E-04)	0.001 *** (2.2E-04)

KeikiF: Deal Mid								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-3.8E-04 (0.001)	-0.001 * (0.001)	-8.8E-05 (3.0E-04)	-3.8E-05 (1.3E-04)	-4.0E-04 (0.001)	-0.001 * (0.001)	-7.0E-05 (3.1E-04)	-2.6E-06 (1.3E-04)
return(-1)					-0.002 (0.182)	-0.134 (0.169)	0.142 (0.138)	-0.272 ** (0.120)
net order flow					-3.3E-04 (0.001)	-4.4E-04 (0.001)	-3.6E-04 (0.001)	0.001 (0.001)

KeikiP: Deal Ask								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.004 (0.007)	-0.001 (0.003)	-2.7E-04 (0.001)	-3.3E-04 (0.001)	-0.004 (0.007)	-3.3E-04 (0.002)	7.7E-05 (0.001)	2.2E-04 (0.001)
return(-1)					0.297 (0.250)	-0.096 (0.123)	-0.231 *** (0.090)	0.307 ** (0.168)
net order flow					0.010 ** (0.006)	0.009 *** (0.002)	0.001 *** (2.5E-04)	0.001 *** (1.9E-04)

KeikiP: Deal Bid								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.004 (0.007)	-0.002 (0.002)	-0.001 (0.001)	-0.001 (0.001)	-0.004 (0.007)	-0.001 (0.002)	-0.001 (0.001)	-2.7E-04 (0.001)
return(-1)					0.257 (0.245)	-0.062 (0.125)	-0.198 ** (0.097)	0.432 *** (0.117)
net order flow					0.015 * (0.009)	0.009 *** (0.003)	0.001 *** (3.0E-04)	7.5E-07 (2.2E-04)

KeikiP: Deal Mid								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.004 (0.007)	-0.002 (0.003)	-4.3E-04 (0.001)	-2.5E-04 (0.001)	-0.004 (0.007)	-0.001 (0.002)	-2.3E-04 (0.001)	2.9E-04 (4.7E-04)
return(-1)					0.098 (0.234)	-0.388 *** (0.100)	-0.411 *** (0.080)	0.336 ** (0.189)
net order flow					0.001 (0.002)	0.001 (0.001)	0.001 * (0.001)	0.003 *** (0.001)

Table 2 News Surprise Impact on Returns (cont'd)

Payroll: Deal Ask								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.015	-0.016 ***	-0.006	-0.004 **	-0.014	-0.023 ***	-0.005	-0.004 **
	(0.018)	(0.005)	(0.005)	(0.002)	(0.019)	(0.005)	(0.006)	(0.002)
return(-1)					0.055	-0.247 **	0.055	-0.082
					(0.282)	(0.126)	(0.210)	(0.129)
net order flow					0.006	-0.011 ***	-0.001	-2.7E-04
					(0.013)	(0.003)	(0.001)	(2.6E-04)

Payroll: Deal Bid								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.017	-0.016 ***	-0.006 *	-0.005 *	-0.016	-0.018 ***	-0.008 *	-0.004
	(0.018)	(0.005)	(0.005)	(0.003)	(0.018)	(0.005)	(0.005)	(0.003)
return(-1)					-0.001	-0.173 *	0.063	-0.214
					(0.271)	(0.126)	(0.199)	(0.244)
net order flow					-0.015 *	-0.005 ***	-0.001 *	-3.7E-04
					(0.012)	(0.002)	(0.001)	(3.6E-04)

Payroll: Deal Mid								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.017	-0.014 ***	-0.004	-0.003 *	-0.017	-0.013 ***	-0.006	-0.003 *
	(0.018)	(0.005)	(0.005)	(0.002)	(0.018)	(0.006)	(0.005)	(0.002)
return(-1)					-0.262	0.066	-0.175	0.434 *
					(0.327)	(0.137)	(0.333)	(0.279)
net order flow					0.002 *	-4.9E-04	0.001	-0.003 **
					(0.001)	(0.001)	(0.001)	(0.002)

Money supply: Deal Ask								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.131 ***	-0.064 *	0.001	-0.008	-0.130 ***	-0.065 **	0.000	-0.007
	(0.051)	(0.041)	(0.023)	(0.010)	(0.052)	(0.041)	(0.023)	(0.010)
return(-1)					-0.048	0.072	-0.079	-0.050
					(0.122)	(0.132)	(0.148)	(0.128)
net order flow					-0.002	-0.003	0.001 *	-2.E-04
					(0.005)	(0.003)	(0.001)	(2.E-04)

Money supply: Deal Bid								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.114 ***	-0.047	-0.010	-0.004	-0.114 **	-0.047	-0.011	-0.002
	(0.049)	(0.040)	(0.025)	(0.010)	(0.050)	(0.040)	(0.025)	(0.010)
return(-1)					-0.012	0.102	-0.087	-0.175 *
					(0.120)	(0.129)	(0.142)	(0.126)
net order flow					2.E-04	-0.003	0.001	-0.001 ***
					(0.004)	(0.003)	(0.001)	(2.E-04)

Money supply: Mid price								
	30min	15min	5min	1min	30min	15min	5min	1min
Surprise	-0.121 ***	-0.048	-0.005	0.004	-0.112 ***	-0.045	-0.004	0.001
	(0.049)	(0.040)	(0.024)	(0.015)	(0.047)	(0.039)	(0.024)	(0.012)
return(-1)					-0.285 **	-0.258 **	-0.129	-0.636 ***
					(0.148)	(0.169)	(0.146)	(0.118)
net order flow					0.002 ***	0.002 ***	4.E-04	0.002 *
					(0.001)	(0.001)	(0.001)	(0.001)

Table 3. News release impact on total deals

Tankan				
	30min	15min	5min	1min
TotalDeal(-1)	1.707 ** (0.883)	1.985 ** (0.850)	0.829 (0.822)	2.134 ** (1.195)
[News]	35.822 (37.101)	-3.869 (22.821)	12.473 (13.969)	7.861 ** (4.039)
(News) ²	-5.106 (4.093)	-0.343 (2.637)	-1.807 (1.593)	-0.771 * (0.458)
Retail				
	30min	15min	5min	1min
TotalDeal(-1)	0.467 *** (0.077)	0.550 *** (0.065)	0.631 *** (0.071)	0.641 *** (0.077)
[News]	-9.934 (12.442)	-2.740 (5.996)	0.354 (2.372)	1.450 ** (0.791)
(News) ²	0.930 (2.088)	0.237 (1.003)	-0.144 (0.399)	-0.186 * (0.132)
PPI				
	30min	15min	5min	1min
TotalDeal(-1)	1.235 *** (0.425)	1.468 *** (0.445)	1.279 *** (0.421)	1.298 ** (0.672)
[News]	232.046 (520.308)	266.484 (273.166)	14.822 (135.857)	20.461 (50.506)
(News) ²	-240.712 (1582.520)	-571.479 (824.441)	-30.722 (418.618)	-76.295 (157.112)
TB				
	30min	15min	5min	1min
TotalDeal(-1)	0.553 *** (0.133)	0.453 *** (0.105)	0.503 *** (0.101)	0.457 *** (0.162)
[News]	-0.002 (0.329)	0.064 (0.164)	0.016 (0.067)	-0.013 (0.024)
(News) ²	0.001 (0.001)	7.5E-05 (4.6E-04)	-1.1E-05 (1.9E-04)	3.8E-05 (6.7E-05)
BOP				
	30min	15min	5min	1min
TotalDeal(-1)	0.650 *** (0.218)	0.634 *** (0.176)	0.571 *** (0.193)	0.313 (0.251)
[News]	-0.393 (0.305)	-0.152 (0.150)	-0.046 (0.072)	-0.019 (0.024)
(News) ²	0.001 * (0.001)	4.2E-04 (3.5E-04)	1.8E-04 (1.7E-04)	4.2E-05 (5.5E-05)
CPI				
	30min	15min	5min	1min
TotalDeal(-1)	0.581 *** (0.243)	0.358 ** (0.185)	0.302 (0.272)	0.012 (0.242)
[News]	-549.074 * (405.400)	-280.045 ** (159.168)	-154.389 ** (83.373)	-16.682 (21.702)
(News) ²	3546.630 * (2195.850)	1946.460 ** (860.693)	888.554 ** (451.854)	54.668 (117.173)

Table 3. News release impact on total deals (Cont'd)

GDPF				
	30min	15min	5min	1min
TotalDeal(-1)	0.469 *	0.485 *	0.758 **	-0.014
	(0.320)	(0.337)	(0.351)	(0.672)
[News]	-174.238	-38.513	18.047	14.849
	140.270	(79.284)	(37.415)	(14.351)
(News) ²	166.595 **	68.512 *	14.658	1.816
	(70.067)	(39.270)	(18.674)	(7.047)
GDPP				
	30min	15min	5min	1min
TotalDeal(-1)	0.944 *	0.558	0.229	1.104 **
	(0.618)	(0.619)	(0.632)	(0.603)
[News]	167.380	132.394 *	50.940	11.434
	(164.779)	(92.568)	(40.568)	(9.328)
(News) ²	-15.344	-15.196	-0.148	-0.331
	(58.210)	(32.657)	(14.442)	(3.325)
KeikiF				
	30min	15min	5min	1min
TotalDeal(-1)	0.352 **	0.780 ***	0.670 ***	0.730 ***
	(0.148)	(0.119)	(0.089)	(0.170)
[News]	-5.126	-2.457 *	-1.250 **	-0.135
	(4.424)	(1.752)	(0.580)	(0.257)
(News) ²	0.157	0.083 *	0.043 **	0.009
	(0.146)	(0.058)	(0.019)	(0.009)
KeikiP				
	30min	15min	5min	1min
TotalDeal(-1)	0.510 ***	0.692 ***	0.713 ***	0.827 ***
	(0.124)	(0.085)	(0.051)	(8.2E-02)
[News]	-7.595	3.486	1.259	0.670
	(22.548)	(7.941)	(2.091)	(0.741)
(News) ²	0.299	-0.379	-0.110	-0.032
	(2.145)	(0.754)	(0.198)	(0.070)
Payroll				
	30min	15min	5min	1min
TotalDeal(-1)	0.521 ***	0.443 ***	0.528 ***	1.030 ***
	(0.153)	(0.160)	(0.204)	(0.312)
[News]	103.380 *	54.808 *	6.335	-2.182
	(68.830)	(37.380)	(15.604)	(4.156)
(News) ²	-35.631 *	-17.481 *	-3.147	0.445
	(25.014)	(13.339)	(5.600)	(1.424)
Money Supply				
	30min	15min	5min	1min
TotalDeal(-1)	0.884 ***	0.682 ***	0.386 ***	0.239 **
	(0.175)	(0.130)	(0.130)	(0.131)
[News]	100.614	51.130	23.902	1.937
	(140.462)	(66.860)	(36.704)	(9.691)
(News) ²	-133.440	-102.402	-44.281	-1.672
	(182.559)	(87.187)	(47.814)	(12.640)