Are the Markets Afraid of Kim Jong-Il?

Byung-Yeon Kim[*]

and

Gérard Roland[**]

[*] Seoul National University
[**] University of California, Berkeley and CEPR.

1. Introduction

Tensions related to the buildup of nuclear weapons in North Korea have been an important source of tension on the international scene in the last decade. The six party talk structure (the two Koreas, China, the US, Japan and Russia) which was put in place to deal with the North Korean threat faces important challenges and there is high uncertainty over how effective it will be in defusing the North Korean threat. South Korea is the first to be affected by the North Korean threat. The South Korean capital, Seoul, with a population of over 10 million people is close to the North Korean border. A nuclear strike from North Korea on Seoul would likely have catastrophic consequences. How likely would such an event be and how credible are the North Korean military threats?

We use in this article event study methodology to study the impact of particular events related to the North Korean threat on financial markets in South Korea. Event analysis identifies the effects of particular events occurring on specific days or even at specific hours on variables such as financial market indices. In the context of tension on the Korean peninsula, some of the important events of recent years were likely to increase political and military tension. This is for example the case of the Naval engagements between the two Koreas on 28 June 2002 or of North Korea's conduct of a nuclear test on October 9 2006. Other events could be seen to reduce the tension such as the first summit between leaders of the two Koreas in June 2000. This Summit was a consequence of the initiation of the Sunshine policy by South Korean President Kim Dae-Jung in 1998, aiming at peaceful reconciliation between both Koreas.

The advantage of event studies is that they reveal the views of financial markets on specific events. The argument is that financial transactions revealing the opinions of a large number of independent traders who put money at stake in financial trades may reveal more information than expert opinions, newspaper articles or declarations by politicians or government officials.[1] Event study methodology provides a way of measuring how markets assess particular events. Event studies have been used increasingly to assess multiple events such as the effectiveness of US policy in Iraq (Chaney, 2007, Greenstone, 2007), the effect of CIA-supported right-wing coups in Chile and Guatemala on shares of companies expected to gain from those coups (Dube, Kaplan and Naidu, 2008), the effect of civil war in Africa on diamond-mining firms (Guidolin and La Ferrara, 2007) and others.

Financial markets in South Korea are sufficiently developed that they can be compared with financial markets of advanced industrialized countries. It is thus not unreasonable to assume that financial markets in South Korea aggregate information at least as efficiently as markets from advanced industrialized countries. Event study methodology can thus be applied on South Korean financial markets.

---

[1] Prediction markets have been expanding in recent years precisely for this reason: they often give better predictions than expert surveys (on this see among others Wolfers and Zitzewitz, 2004; MacKinlay, 1997).

We selected 20 important events related to the tension in the Korean peninsula and investigated their effect on 1) the Korean stock market KOSPI index, 2) the South Korean exchange rate and 3) bond yield spreads between South Korean and US treasury bills. Surprisingly, the main result is that in nearly all cases, these events, which have often been dramatized in the world media, have no significant impact on either of these variables or only a very small one. The least sensitive variable to events is the bond yield spread. The only significant event to affect the bond yield was the announcement on April 10 2000 that leaders of both Koreas agreed to meet for the first time. The yield spread between Korean Treasury bond and US one was reduced by 0.01 basis points on the following day. The most sensitive variable to events is the exchange rate and the stock market is somewhat in between. Note however, that foreign exchange rate effects are mostly non-significant or small. The event that had the largest effect on the foreign exchange rate was the nuclear test that took place on October 9 2006. The Korean Won lost 1.6 percent in that event window. We also find no significant impact of events on listed firms that would a priori be likely to suffer from increased tension between the two Koreas.

The overall picture that emerges is that South Korean financial markets have not reacted either to signs of escalation of tension or to signs of easing of tension. This evidence suggests that South Korean financial markets do not perceive the North Korean threats as credible. Since South Koreans and the South Korean economy would be in direct line to suffer from some form of military or even nuclear aggression by the North Korean regime, our results strongly suggest that North Korean threats and aggressive verbal attacks on South Korea should be heavily discounted and not taken too seriously. This is consistent with the view that the North Korean regime has become economically extremely weak and uses military threats in order to extract aid. The threats themselves however do not appear to be credible for at least two reasons. First of all, the North Korean economy is already so weak that the regime could not sustain a military aggression without facing the prospect of collapse. Second, any deadly strike against South Korea would face immediate retaliation and also near immediate regime collapse. It is in the interest of the North Korean regime to appear threatening. However, if one does not believe these threats, one will strongly discount the aggressive discourse and behavior of the North Korean communist regime. The policy relevance of these results is thus quite obvious.

In section 2, we briefly represent the event study methodology we will be using. In section 3, we describe the events we selected. In section 4, we present our main results and study the impact of high profile events in the tension between the two Koreas between 2000 and 2008 on financial markets as well as on individual firms. In section 5, we implement a whole series of robustness checks. Section 6 concludes.

2. The empirical methodology

Event study methodology is useful to look at high frequency effects of particular events on financial markets. The following specification shows the standard event study methodology.

$$y_t = \alpha + \beta'X + \sum_i \theta_i D_{event_i} + \varepsilon_t \qquad (1)$$

where y_t is the variable relative to financial markets, X is a vector of control variables, and D_{eventi} is an indicator that is equal to one if the event of interest occurs at time t.

The above specification might be appropriate for the event whose effect starts and ends on period t. However, the effect of the event may be prolonged for more than one period. In order to capture the full effect of the event, one needs a specification that allows the effect on periods prior to and posterior to the event. Hence, we use the methodology of cumulative abnormal returns to analyze the effect of a particular event. Cumulative abnormal returns (CARs) are the summation of abnormal returns (AR) during the event window. As $CAR_1 = AR_1$ and $CAR_t = CAR_{t-1} + AR_t$ for $t>1$, equation (1) can be rewritten as:

$$y_1 = \alpha + \beta'X + CAR_1 + \varepsilon_t$$
$$y_t = \alpha + \beta'X + CAR_t - CAR_{t-1} + \varepsilon_t, \qquad 2 \le t \le T. \qquad (2)$$

We will use the dummy variable method proposed by Salinger (1992) estimating the cumulative abnormal return inside the event window. In more detail, assuming that the event window is from two periods prior to the period when the event occurred to two periods posterior to the event period, we can estimate equation (2) as below:

$$y_t = \alpha + \beta'X + \sum_{t=-2}^{t=2} \theta_{kt} D_{k(T_k+t)} + \varepsilon_t \qquad (3)$$

where the dummy variable from $D_{k(T_k-2)}$ to $D_{k(T_k+1)}$ takes on the value 1 for observation T_k+t, -1 for observation T_k+t+1 and equal to 0 for other observations. The last dummy variable, $D_{k(T_k+2)}$ takes on the value 1 for observation T_k+2 and 0 otherwise. This coding strategy implies that $\theta_{k,-2} = CAR_{k(1)} = AR_{k(1)}$, $\theta_{k,-1} = CAR_{k(2)}$, and so on. According to Salinger (1992), this method has the advantage that the standard errors are reported correctly.

If we look at the effect of a particular event on the South Korean KOSPI index, we have a regression with the following form:

$$Kospi_t = \alpha + \beta Dow_t + \gamma Nikkei_t + \sum_{t=-2}^{t=2} \theta_{kt} D_{k(T_k+t)} + \varepsilon_t \qquad (4)$$

Kospir$_t$ is a variable measuring the return on the KOSPI index at time t, in our case on day t. We want to abstract from the effects of aggregate news or worldwide variations in stock market return. We therefore use the return on the Dow Jones index *Dowr$_t$* and Nikkei index *Nikkeir$_t$* as control variables.[2] While events in the Korean peninsula may affect world financial markets, they are likely to affect South Korean financial markets more. On the other hand, aggregate world events are likely to affect all stock markets in a similar way. Measuring abnormal returns on South Korean financial markets thus requires filtering out aggregate movements on other markets. As South Korean stock market movements are most closely correlated with those on the New York and Tokyo stock exchanges and we use the return on these markets as a control variable. $D_{k(T_k + t)}$ is the dummy variable related to the particular event, which we explained as above.

We perform similar regressions for the exchange rate of the Korean won against US dollars, controlling for exchange rate between yen and Korean won, and that between euro and Korean won. We also added the leads and lags of Dow Jones index together with the contemporary Dow Jones index, which is expected to capture the spillover from the stock market to foreign exchange markets. More specifically, we run the following regression:

$$EXUSKR_t = \alpha' + \beta' EXJPKR_t + \gamma' EXEUKR_t + \sum_{t=-2}^{t=2} \lambda_t DOWJ_t + \sum_{t=-2}^{t=2} \theta_{kt} D_{k(T_k + t)} + \varepsilon'_t \qquad (5)$$

where $EXUSKR_t$ is the daily exchange rate between the Korean currency and the U.S. dollar expressed as the amount of won per U.S. dollar; $EXJPKR_t$ and $EXEUKR_t$ refer to the daily exchange rate between the Korean won and the Japanese yen and that between the Korean won and euro, respectively; $DOWJ_t$ is the Dow Jones index.

Similarly, we run the following equation for the yield spread between US Treasury bill with three years maturity and Korean one with the same maturity, controlling for the yield spread between US corporate bond of companies having AAA according to Moody's rating and Korean corporate bond with the same rating:

$$\Delta YDSPTRES_t = \alpha'' + \beta'' \Delta YDSPCOR_t + \sum_{t=-2}^{t=2} \lambda'_t DOWJ_t + \sum_{t=-2}^{t=2} \theta_{kt} D_{k(T_k + t)} + \varepsilon''_t \qquad (6)$$

where $\triangle YDSPTRES_t$ and $\triangle YDSPTRES_t$ are the change in the yield spread of treasury bills and corporate bonds described as above, respectively.

---

[2] Using *Nikkeir$_t$* may not be appropriate to test the significance of the North Korean-related events on South Korean financial markets if these affect Japanese financial markets to the same extent. Hence, we checked the robustness of our baseline results without *Nikkeir$_t$*.

3. Identification of Events

We identified North Korean-related events using both the diary of daily events relative to North Korea documented by the Ministry of Unification as well as that documented by the Korean Institute for National Unification. The former is published online on a regular basis with some months delay while the latter is published at the end of each year. These documents contain detailed information on events concerning North Korea together with the dates of the events. We identified the main events we are using as follows. First, in order to be qualified as a main event, it should be included in both document sources and have received an important treatment in newspapers. Second, the effects of main events should be perceived as large and having significant implications for South - North Korean relations.

We used the dates of events as recorded in the documents but needed to adjust the dates in some cases because financial markets were closed on those dates. In such cases, we recorded as the date the following day in which financial markets were open. We also checked whether these event dates coincided with other events that might affect financial markets but were independent of North Korean matters. However, we found no such overlapping events.

In Table 1, we classified the above events into four categories: inter-Korean politics (political), military conflict (military), signs of economic openness (open), and external factors (external). According to our classification, six out of 20 events are classified as military. Also six events are categorized as external, five as part of inter-Korean politics and the remaining three as some signs of economic openness. This diversity in the characteristics of the identified events makes is possible to test differential impacts of North Korean-related events.

4. Estimation Results of the Effects of North Korea-related Events.

We estimate equation (1) using the events identified in the previous section. In terms of the event window, we introduce CAR dummies before the event to take into account expectation effects on the market when they exist. We also take into account the possibility that the effects of the event may take place with some delay and introduce CAR dummies after the event. We found that an event window of 5 days (2 before, the same day and two after the event) is in general sufficient to capture possible pre- and post-event effects.

We include all the CAR variables related to the above twenty events as regressors together with control variables. Control variables in the equation for stock markets include the return of the Dow Jones Index and that of the Nikkei Index. In the equation for exchange rates, we include exchange rates between the South Korean Won and the Euro as well as that between the Won and the Japanese Yen. In addition, we include the Dow Jones index with two leads and two lags to control for possible spillover effects of the US stock market on the dollar. As for the equation for bond markets, the change in

the yield spread between Korean and US commercial bonds is included as a regressor together with the variables relative to the Dow Jones index.

Table 2 summarizes the overall estimation results by putting together all the events. We only report whether or not there was a significant effect of the event as well as the level of significance. Empty cells mean insignificant results. The dependent variable in Column (1) refers to the daily stock market return which is defined as the growth rate of the KOSPI index. In Column (2), we use as dependent variable the growth rate of the daily exchange rate between the Korean currency and the U.S. dollar (expressed as the amount of Won per U.S. dollar). A positive (negative) sign of the coefficient on an event means that the Korean currency depreciates (appreciates) against the U.S. dollar. The dependent variable in Column (3) is the change in the yield spread between a South Korean and a United States treasury bill (both at three year maturity). In Table 2, we report the sign of the event if any of the five event-related CAR variables is significant at the 10% significance level. In other words, we apply the lowest criterion possible to discern the significance of an event. A stricter test is a joint test for the significance of the five CAR dummies. The results of the joint test are presented in Table 2 with asterisk marks.

As the table shows, most of the events did not have a significant effect either on the stock market, the exchange rate or the bond yield spread. Only nine out of sixty event variables (twenty times three dependent variables) turned out to be significant. At the 5% significance level, the number of significant events drops to seven. Furthermore, the results of the joint test involving the five CAR dummy variables relative to an event suggest that only three events were significant. Among these, there is no single event that significantly affects all of the three financial markets. There are two events that affect two markets out of three significantly (though only one out of two is jointly significant): the announcement of the holding 1st inter-Korean summit (Event 1) and the conduct of the North Korean nuclear test (Event 13). Event 1 affects both the stock and bond market, and Event 13 affects the stock and exchange rates markets simultaneously. The other events found to be significant influence only one market and the only one for which the joint effect is significant is the first Summit between North and South Korean leaders (Event 2). It would appear that among all important events selected, events related to the first Summit between the two leaders had a significant positive effect on the stock market while only the North Korean nuclear test had a significant effect on the exchange rate.[3]

The most important conclusion to be drawn from Table 2 is that financial markets in South Korea are not really affected by events related to the North Korean threat. In other words, markets consider the North Korean threat not to be credible. The positive effect on stock markets of the events related to the first North-South Korean Summit can be more easily interpreted as expectations of more business opportunities with North Korea rather than as related to a reduction in the North Korean threat. Moreover, the fact that the conduct of the North Korean nuclear test had a significant effect only on the exchange

---

[3] If we count the number of CAR variables that were significant at the 10 % level, we find more for the foreign exchange while bond markets had the least.

rate could be explained by financial transactions involving foreign agents, possibly of a speculative nature. Moreover, Korean markets for foreign exchanges are relatively shallow compared to the other two markets, suggesting the possibility of being swayed easily by some players.[4] Otherwise, stock and bond markets would also be affected.

In order to better illustrate what is going on, we now present in somewhat more detail estimates for separate events. Note that the estimates for separate events are very similar to those for pooled events. We focus on five important events.

Table 3 shows the estimates for the announcement of the first Summit between the two Koreas on April 10 2000. Even though the announcement was unexpected, some information must have leaked: the delegates of two Koreas agreed to hold summit at a confidential meeting in Beijing. Our data show that there are significant cumulative abnormal returns in the days before the announcement and on the day of the announcement there is a 6.5% cumulative abnormal return. This appears to be a rather large number. However, if we look at the raw numbers (see Figure A.1 in the appendix), the effect does not seem large in comparison to the volatility of the Kospi index. The Kospi index increased by 3.9% on the day of the announcement of the First Summit. The bond yield spread also goes down two days before by a tenth of a percentage point but does not move subsequently.

In Table 4, we see the effects of the Naval Engagement in the West Sea on June 29 2002. We see no significant effect. The same can be said for the testing by North Korea of an Anti-Ship Cruise missile on February 24 2003 shown in Table 5. As can be seen from Table 6, the conduct of a nuclear test in North Korea on October 9 2006 this had a negative effect on the stock market the same day and the next day and a negative effect on the Korean currency the same day. Again, the magnitude of change on the stock market is not large in comparison to the volatility on these markets as can be seen in figures A1 in the appendix. We however do see a visible spike in the exchange rate on that date. More recently, the harsh attacks by the North Korean regime against the South Korean President Lee Myung-Bak on April 1 2008 did not have an effect that day, as can be seen from Table 7. We do see an effect on the exchange rate two days before but it is not clear that this is related to this event. North Korea launched missile test on Saturday March 28th 2008 (event 19) during which the stock market was closed and thus t refers to Monday March 30 2008. Since North Korea singled the South Korean president out for criticism on Tuesday 1 April 2008 and this was an unexpected event, the missile test effects might have been mixed with the effect of the criticism on president Lee in t-2.

We looked at the effects of the various events on the return of stocks of three selected individual companies that are heavily involved in business with North Korea. Namhae Chemical is the company that exports fertilizers to North Korea. Shinwon is a company producing clothes that built a factory in the Gaesung Industrial Complex in North Korea in October 2004 and began to produce clothes there in the early 2005. Kwang Myung

---

[4] Korean stock markets ranks 14th in the world in terms of its size. In contrast, the amount of daily transactions in Korean foreign exchange markets is about 15% of those of countries whose stock market has a similar size to Korean one.

Electric Engineering is the company that is responsible for the provision of electricity from South to North Korea.

As regards individual companies, it is sometimes difficult to disentangle company-specific factors affecting the particular company from those related to North Korea if two factors take place in the same period. Some events are significant for Namhae Chemical. That is, events 6, 17, and 18 affect stock returns of Namhae Chemical positively. Nevertheless, the effects of all other events are not precisely pronounced for Namhae Chemical. Furthermore, the stock prices of the other two companies are not affected by any of the events.

Tables 8-10 again look at the same five selected events. The announcement of the North-Korean Summit had no significant effect on the companies doing business with North Korea with the exception of Namhae Chemical (the next day with significance at the 10 % level). In general however, the results are mostly non significant. In particular, the North Korean missile test had no effect on the companies we selected. Overall, we find that events related to the North Korean threat mostly had no significant effect on financial markets in South Korea as well as on individual firms.

5. Robustness Checks

In this section, we present some robustness checks. Instead of looking at the particular events we chose, we instead regressed financial market variables on the changes of the KOPI index. This is an index compiled by the Asia-Pacific Research Center at Hanyang University. The method for compiling the KOPI is the same as that for the COPDAP (Conflict and Peace Database) developed by Edward Azar at the University of Maryland. Information is collected on daily events surrounding North Korea from published sources, mainly newspapers. Their significance is evaluated and the score of each event is aggregated according to a pre-determined scale. The index can range between –105 to 92, representing respectively complete warfare and voluntary unification.

We used the change in the daily index of KOPI between June 2000 to June 2008 as an independent variable. We used the same controls as in Table 2 for the equation of stock market return, and added Dow Jones index with two lags and two leads for the equations of exchange rates and change in yield spread. In addition, we added two lags and two leads of KOPI to take into account the possibility of leakage of news and lagged effects. Table 11 shows estimation results. There has absolutely no significant effect. The results are even stronger than in the previous section.

We further tested whether there are structural breaks in our series of stock returns, exchange rates, and yield spread. A concern was raised about possible instability of parameters of returns obtained by event studies in the presence of structural breaks

(Burnett, 1995).[5] In the presence of structural breaks, the results from an event study analysis might thus overlook certain significant events. We apply two methods to detect possible structural breaks: the first is data-driven and the second is based on our prior knowledge about possible structural breaks.

Our first method to detect possible structural breaks in our series is to let data identify such breaks and see if they can be related to particular events. We use an econometric technique developed by Bai and Perron (1998; 2003) which searches for mean breaks in the sample period. This method has the advantage that it does not require us to know the number of breaks before running regressions. If we decide the maximum number of possible breaks, it is designed to pinpoint significant changes in the mean level of a series. We ran a program to detect structural breaks for the Kospi index return, the change in the exchange rate between the South Korean Won and the U.S. dollar and the change in the yield spread between Korean and US three-year treasury bills. We did not find any structural breaks in any of the three series. In these tests, we allowed for heterogeneous and autocorrelated errors as suggested by and Perron (1998; 2003).

The second method uses our prior information about potential structural breaks. The previous South Korean government led by Daejung Kim developed the so-called "Sunshine Policy" of appeasement towards North Korea. Daejung Kim believed that a gentle and peaceful approach toward North Korea involving the provision of aid would be more effective in transforming North Korea as compared to the tough stance that had existed so far. The following president, Moohyun Roh, also adhered to this policy. However, the incumbent president, Myungbak Lee, who started his term in Feb. 2008, publicly denounced the Sunshine Policy and changed the direction of policy by being tougher with North Korea. This suggests that there might be two separate periods in our sample: the first one is from the 1st summit of the two Korean leaders in June 2000 until the starting date of the incumbent president, Myungbak Lee, on 25th Feb. 2008, and the second period from 25th Feb. 2008 onwards. We coded a "sunshine" dummy for the first period and a "new policy" dummy, respectively. As one can see from Table 12, none of the dummy variables are significant except for the exchange rate in the second period. This probably however reflects mainly the depreciation the Korean currency due to subprime mortgage crisis since Myungbak Lee came to power. We also tested the possibility of break in slopes by using an interaction term between policy dummies and US stock return, and found that such terms are not significant. We conclude that there are no structural breaks related to North Korean events or to changes in the South Korean government policy.

We also regrouped the events according to their characteristics: military, political, related to openness or external factors according to the classification in Table 1. We further divided the events into partially expected and unexpected ones. We define as partially expected events those for which the Korean newspapers did not publish reports, information or rumors prior to their occurrence. We found that the following three events were unanticipated according to that definition: Bush's axis of evil speech, the NLL naval

---

[5] This can cause measurement errors in abnormal returns as the parameters of the return generating process changes over the sample period.

engagement in West Sea, and the unofficial visit of Kim Jong-Il to China. Note that while the others were partially expected, they also entailed uncertainty as to what would really happen. For example, the first meeting between the leaders of both Koreas was expected but it was not known in advance how this meeting would go. A similar reasoning can be applied to other events. We then ran joint tests of the significance of the different classes of events. The results are shown in Table 13.

Again, apart from political events, all other events are not significant and the political events only affect the stock market return. Neither the unexpected nor the partially expected events have any significant effect when pooled together. As stated above the significance of the political effects might not reflect a reduction of the North Korean threat but more simply the expectation of profits from more business with the North.

The figures in the appendix showing the three series present little suggestive evidence of unit roots in our series. The presence of unit-roots may cause our regressions spurious. In order to check the existence of unit roots more formally, we applied augmented Dickey-Fuller tests for the three dependent variables and found that all three variables are stationary.

We also performed some diagnostic test. These suggest that there are some problems in the residuals as Table 14 shows. Either they violate the assumption of homoskedasticity or that of no temporal correlation, or both of them. In addition, the residuals from the exchange rate regression may not pass the white-noise test. In order to correct for possible biases due to these violations, we used an instrumental variable approach combined with a technique for correction of autocorrelation. We employ the combination of the Newey-West method and General Method of Moments in which external instruments are specified, when they are available, and all other internal instruments with optimal weighting matrix are used as well. As regards bond spread, we used Korean-US exchange rates and Dow Jones index as external instruments for corporate bond spread between US and South Korea. In a similar way, the exchange rate between euro and won and the return on the Dow Jones index are used as external instruments for the exchange rate between yen and won and the return on Nikkei index, respectively.

As can be seen in Table 15, the results are barely changed relative to Table 2. Only some minor changes occurred compared to Table 2. In column (2), event 19, (North Korea conducting a missile test) now has a jointly significant negative effect on the South Korean currency. Event 13 (the North Korean nuclear test), which was significant at the 5% level in Table 2, became now significant at the 1% level. However, there are no events that became newly significant after these corrections were made.

6. Summary and Conclusions

We performed event study analysis to see whether the increased tension on the Korean peninsula related in particular to the North Korean nuclear threat had affected South Korean financial markets. The striking result is that there are mainly no effects. The

strongest effects we find are related to the announcement of the first meeting between leaders of North and South Korea that took place in June 2000 and one can argue that this reflects more expectations of business opportunities with North Korea rather than a reduction in the North Korean threat. Overall, the fact that the South Korean markets appear not to be afraid of events related to the North Korean threat provides strong suggestive evidence that this threat is not credible. International news media sometimes play up this threat but those who should be the most afraid of it, namely South Koreans, appear not to fear the North Korean threat. This is at least the conclusion from the opinions as shaped in the South Korean financial markets.

This conclusion is not as intriguing as it may appear at first sight. The North Korean economy has become increasingly weak and dependent more and more on foreign assistance (Noland and Haggard, 2007; Kim et al., 2007). The regime would not likely be able to sustain any kind of military adventure. Moreover, the North Korean leaders are not suicidal and know that if they ever are in state of throwing a nuclear bomb on South Korea, this would mean assured self-destruction. The interest of the North Korean leaders is to appear threatening in order to extract financial aid from the international community. This allows them to buy time before the final collapse of the economy or of the regime itself.

These results give quite clear policy conclusions. One should not fear the North Korean regime and its threat. A hasty attempt to persuade North Korean authorities to stop the further launch of missiles or rockets can be interpreted by North Koreans as an increased possibility of extracting aid from South Korea and other countries. A calm but principled approach even including the policy of benign neglect could help the North Korean leader to realize that their threat would not work out.

REFERENCES

Bai, J. and Perron, P., 1998 "Estimating and Testing Linear Models with Multiple Structural Changes," *Econometrica*, Vol. 66, No. 1 47–78.

Bai, J. and Perron, P., 2003, "Computations and Analysis of Multiple Structural Change models," *Journal of Applied Econometrics*, Vol. 18 , 1–22.

Burnett, John, Carroll, C., and Thistle, P., "Implications of Multiple Structural Changes in Event Studies," *Quarterly Review of Economics and Finance*, Vol. 35, No. 4, 467-481.

Chaney Eric, 2008, "Assessing Pacification Policy in Iraq: Evidence from Iraqi financial Markets" *Journal of Comparative Economics*, Vol. 36, No. 1, 1-16.

Dube, Arindrajit, Kaplan, Ethan, and Naidu, Suresh., 2008, "Coups, Corporations, and Classified Information," Law and Economics Workshop paper 21, UC Berkeley.

Greenstone, Michael, 2007. "Is the "Surge" Working? Some New Facts," NBER Working Papers 13458.

Guidolin, Massimo and Ferrara, Eliana La, 2007. "Diamonds Are Forever, Wars Are Not: Is Conflict Bad for Private Firms?," *American Economic Review*, vol. 97(5), 1978-1993

Wolfers, Justin and Eric Zitzewitz, 2004. "Prediction Markets," *Journal of Economic Perspectives*, vol. 18(2), 107-126.

Kim, Byung-Yeon, Kim, Seok-Jin, and Keun Lee, 2007, "Assessing the Economic Performance of North Korea, 1954-1989: Estimates and Growth Accounting Analysis," *Journal of Comparative Economics*, Vol. 35, No. 3, 564-582.

MacKinlay, Craig., 1997, "Event Studies in Economics and Finance," *Journal of Economic Literature*, Vol. XXXV, 13-39.

Noland, Marcus, and Haggard, Stephen, 2007, *Famine in North Korea: Markets, Aid and Reform*, Columbia University Press.

Salinger, Michael., 1992, "Standard Errors in Event Studies," *Journal of Financial and Quantitative Analysis*, Vol. 27, No., 1, 39-53.

Table 1: Identification of Main Events and their Types

Event	Description	Date	Type
1	Two Koreas Agree to First Meeting of their Leaders	April 10 2000	Political
2	1st South and North Korean Summit	June 14 2000	Political
3	Washington Eases Sanctions Against North Korea	June 19 2000	External
4	Bush's axis of evil speech	Jan. 29 2002	External
5	Northern Limit Line (NLL) West Sea Naval Engagement	July 2 2002[1]	Military
6	North announces Kumgang-san as Tourist Region	Nov. 13 2002	Open
7	North Korea's launching of an anti-ship cruise missile	Feb. 24 2003	Military
8	Agreement of Inter-Korean Economic Cooperation	Aug. 20 2003	Open
9	first round of the six-party talks in Beijing	Aug. 27 2003	External
10	Unofficial visit to China by Kim Jong-il	Jan. 10 2006	Open
11	North Korea test-fires 7 missiles	July 5 2006	Military
12	North Korea pledges to test nuclear bomb	Oct. 4 2006[2]	Military
13	North Korea Conducts Nuclear Test	Oct. 9 2006	Military
14	Initial Actions for the Implementation of the Joint Statement	Feb. 13 2007	External
15	Two Koreas Agree to Second Meeting of their Leaders	Aug. 8 2007	Political
16	North Korea agreed to declare & disable all nuclear facilities	Sep. 3 2007[3]	External
17	2nd South and North Korean Summit	Oct. 2 2007	Political
18	New York Philharmonic Live from North Korea	Feb. 26 2008	External
19	North Korea conducted missile tests	March 28 2008	Military
20[4]	N. Korea singles President Lee out for criticism[4]	April 1 2008	Political

1) Notes: NLL West Sea Naval Engagement occurred on Saturday 29th June 2000 and the following Monday, 1st July 2000 was a public holiday. This led us to record 2nd July 2000 as the event day.

2) North Korea pledged to test nuclear weapon on 3rd October 2006, which was a public holiday in South Korea, and thus the following day, 4th October, was recorded as the event day.

3) North Korea agreed to declare and disable all her nuclear facilities on 1st September 2007 but US financial markets were closed in this day, and thus we recorded 3rd September 2007 as event date.

4) This event was included in neither diaries. Nevertheless, mass media and the public regarded this criticism as signal to the new South Korean government that future relations between the two Koreas would deteriorate.

Table 2: Summary of Estimation Results of North Korean Event Studies

Event no.	Stock market return (growth in % of the Kospi index)	Exchange rate (% change against USD)	Change in yield spread between US and S. Korea (treasury bill)
1	+***		-
2	-***		
3			
4		-	
5			
6			
7			
8			-
9			
10		-	
11			
12			
13	-	+**	
14			
15			
16			
17			
18			
19		+	
20			
Number of significant events	3	4	2

Note: We report an event as significant if at least one of the days in the event window is significant at the 10 % level. The asterisk next to the sign denotes that the five CAR variables relative to the event jointly significant. ***: significant at 1% significance level. **: significant at 5% significance level. *: significant at 10% level. Event 19 and 20 occurred on 28th March 2008 and 1st April 2008, respectively. As a consequence, some days are overlapped in estimations, causing drops of some CARs. The decision on which event is significant in determining exchange rates depends on which CAR dummies are dropped. In this table, we dropped two CAR dummies relative to Event 20.

Table 3: Effects of Announcement of the first South and North Korean Summit (Event 1)

	Stock market return (KOSPI index)	Exchange rate (% change against USD)	Change in yield spread between US and S. Korea (treasury bill)
t-2	3.969 (2.70)***	-0.448 (1.02)	-0.109 (2.06)**
t-1	3.927 (1.89)*	-0.575 (0.93)	-0.103 (1.38)
t	6.516 (2.56)**	-0.285 (0.37)	-0.089 (0.97)
t+1	4.995 (1.70)*	-0.311 (0.35)	-0.066 (0.62)
t+2	1.908 (0.58)	-0.413 (0.42)	-0.066 (0.55)

Table 4: Effects of West Sea Naval Engagement (Event 5)

	Stock market return (KOSPI index)	Exchange rate (% change against USD)	Change in yield spread between US and S. Korea (treasury bill)
t-2	-0.208 (0.14)	-0.070 (0.16)	-0.000 (0.00)
t-1	1.913 (0.92)	0.674 (1.08)	-0.041 (0.55)
t	2.521 (0.99)	0.265 (0.35)	0.020 (0.22)
t+1	2.174 (0.74)	0.198 (0.23)	0.031 (0.29)
t+2	5.311 (1.61)	0.259 (0.26)	0.046 (0.39)

Note: The West Sea naval engagement occurred on Saturday 29 June 2002 during which the Korean stock market was closed. In addition, Since 1st July 2002, the next day after the incident was a public holiday, *t* refers to 2nd July 2002 in these estimations.

Table 5: Effects of Testing Anti-ship Cruise Missile (Event 7)

	Stock market return (KOSPI index)	Exchange rate (% change against USD)	Change in yield spread between US and S. Korea (treasury bill)
t-2	1.030 (0.70)	-0.146 (0.33)	0.007 (0.14)
t-1	1.669 (0.80)	0.043 (0.07)	0.005 (0.07)
t	3.457 (1.36)	-0.539 (0.71)	0.008 (0.09)
t+1	1.104 (0.38)	-0.176 (0.20)	-0.012 (0.12)
t+2	0.848 (0.26)	-0.630 (0.64)	-0.023 (0.19)

Table 6: Effects of Conducting Nuclear Test (Event 13)

	Stock market return (KOSPI index)	Exchange rate (% change against USD)	Change in yield spread between US and S. Korea (treasury bill)
t-2	-0.369 (0.25)	0.105 (0.24)	0.028 (0.53)
t-1	-1. 412 (0.68)	0.288 (0.46)	0.057 (0.76)
t	-5.374 (2.11)**	1.903 (2.50)**	0.045 (0.50)
t+1	-4.912 (1.67)*	1.557 (1.77)*	-0.004 (0.04)
t+2	-4.843 (1.47)	1.376 (1.40)	0.019 (0.16)

Table 7: Effects of North Korea's Criticizing South Korean President (Event 20)

	Stock market return (KOSPI index)	Exchange rate (% change against USD)	Change in yield spread between US and S. Korea (treasury bill)
t-2	1.246 (0.49)	1.620 (2.12)**	0.030 (0.33)
t-1	2.879 (0.98)	1.302 (1.48)	0.129 (1.22)
t	1.795 (0.55)	0.598 (0.61)	0.065 (0.55)
t+1	1.243 (0.34)	-0.314 (0.29)	-0.048 (0.37)
t+2	1.383 (0.35)	-0.401 (0.34)	-0.079 (0.56)

Table 8: Stocks of Individual Companies: Effects of the Announcement of the First South- North Korean Summit (Event 1) and the West Sea Naval Engagement (Event 5)

	Event 1			Event 5		
	Namhae Chemical	Shinwon	Kwang Myung E.	Namhae Chemical	Shinwon	Kwang Myung E.
t-2	-1.722 (0.51)	-0.014 (0.00)	14.11 (0.54)	-2.391 (0.70)	13.27 (0.13)	7.301 (0.28)
t-1	-1.841 (0.38)	-2.259 (0.02)	13.24 (0.36)	-2.584 (0.54)	29.63 (0.21)	15.28 (0.41)
t	9.492 (1.61)	14.05 (0.08)	27.62 (0.61)	-4.056 (0.69)	27.30 (0.16)	22.33 (0.49)
t+1	11.743 (1.73)*	4.93 (0.02)	30.61 (0.58)	-4.063 (0.60)	27.52 (0.14)	22.89 (0.43)
t+2	9.469 (1.25)	4.42 (0.02)	25.96 (0.44)	-3.386 (0.45)	41.68 (0.18)	22.60 (0.38)

Table 9: Stocks of Individual Companies: Effects of the North Korean Test of an Anti-ship Cruise Missile (Event 7) and North Korea Conducting a Nuclear Test (Event 13)

	Event 7			Event 13		
	Namhae Chemical	Shinwon	Kwang Myung E.	Namhae Chemical	Shinwon	Kwang Myung E.
t-2	-2.447 (0.72)	-2.820 (0.03)	-1.698 (0.06)	0.315 (0.09)	-2.055 (0.02)	-0.859 (0.03)
t-1	-2.290 (0.48)	-9.307 (0.07)	0.949 (0.03)	-0.422 (0.09)	-8.583 (0.06)	-5.838 (0.16)
t	-1.738 (0.30)	-6.857 (0.04)	0.217 (0.00)	-8.598 (1.46)	-27.93 (0.12)	-20.76 (0.46)
t+1	-3.342 (0.49)	-16.73 (0.08)	-6.043 (0.11)	-6.771 (1.00)	-24.17 (0.12)	-13.52 (0.26)
t+2	-1.451 (0.19)	-16.51 (0.07)	-6.037 (0.10)	-6.250 (0.82)	-26.30 (0.12)	-14.41 (0.24)

Table 10: Stocks of Individual Companies: Effects of North Korea's Criticizing South Korean President (Event 20)

	Event 20		
	Namhae Chemical	Shinwon	Kwang Myung E.
t-2	2.409 (0.41)	2.052 (0.01)	-2.981 (0.07)
t-1	3.352 (0.49)	-2.515 (0.01)	-2.990 (0.06)
t	-1.512 (0.20)	-6.356 (0.03)	-1.750 (0.03)
t+1	-3.685 (0.44)	-8.450 (0.03)	-3.711 (0.06)
t+2	-3.254 (0.36)	-11.11 (0.04)	1.801 (0.03)

Table 11: Robustness Check using KOPI

	Stock market return	Exchange rate (% change against USD)	Change in yield spread between US and S. Korea (treasury bill)
$\Delta kopi_{t-2}$	-0.006(1.41)	0.002 (1.39)	-0.000 (0.24)
$\Delta kopi_{t-1}$	-0.006(1.11)	-0.001 (0.51)	-0.000 (1.22)
$\Delta kopi_{t}$	-0.009(1.51)	0.003 (1.30)	-0.000 (0.33)
$\Delta kopi_{t+1}$	-0.006 (1.02)	-0.001 (0.45)	0.000 (0.44)
$\Delta kopi_{t+2}$	-0.004 (1.02)	-0.001 (0.33)	0.000 (0.10)
Return on Dow Jones	0.062(2.10)*		
Nikkei 225	0.657(29.66)**		
Won-yen exchange rates		-0.051 (2.47)*	
Won-euro exchange rates		-0.103 (5.10)**	
Corporate bond spread			0.963 (52.74)**
Dowjones$_{t-2}$		0.001 (8.25)**-	-0.000 (0.25)
Dowjones$_{t-1}$		0.001 (7.10)**	0.000 (4.24)**
Dowjones$_{t+1}$		-0.000 (0.62)	-0.000 (3.27)**
Dowjones$_{t+2}$		0.000 (1.18)	-0.000 (0.87)

Table 12: Tests of Structural Breaks due to Sunshine Policy and Policy under New Government

	Stock market return	Exchange rate (% change against USD)	Change in yield spread between US and S. Korea (treasury bill)
Sunshine dummy	0.165 (1.20)	0.012 (0.28)	0.005 (0.97)
New policy dummy	0.021 (0.10)	0.191 (2.80)***	-0.009 (1.07)

Table 13: Joint Tests for Significance of Groups of Events

Events	Categories	Stock market return	Exchange rate (% change against USD)	Change in yield spread between US and S. Korea (treasury bill)
Types	Political	F(23, 2051) = 2.06 [0.0022]***	F(23, 2044) = 0.50 [0.9760]	F(22, 2045) = 1.24 [0.1989]
	Military	F(24, 2051) = 0.92 [0.5789]	F(24, 2044) = 1.26 [0.1763]	F(25, 2045) = 0.63 [0.9222]
	Open	F(15, 2051) = 0.37 [0.9865]	F(15, 2044) = 0.98 [0.4779]	F(15, 2045) = 0.73 [0.7529].
	External	F(30, 2051) = 0.52 [0.9864]	F(30, 2044) = 0.45 [0.9954]	F(30, 2045) = 0.56 [0.9753]
(Un)expected	Expected	F(77, 2051) = 1.01 [0.4668]	F(77, 2044) = 0.71 [0.9716]	F(77, 2045) = 0.77 [0.9267]
	Unexpected	F(15, 2051) = 0.89 [0.5777]	F(15, 2044) = 1.18 [0.2840]	F(15, 2045) = 0.51 [0.9358]

Table 14: Diagnostic Tests

	Stock market return	Exchange rate (% change against USD)	Change in yield spread between US and S. Korea (treasury bill)
Heteroskedasticity	Chi2(1)=5.14 [0.023]**	Chi2(1)=0.96 [0.327]	Chi2(1)=5.65 [0.018]**
Autocorrelation	Chi2(6)=10.116 [0.120]	Chi2(6)=22.67 [0.001]***	Chi2(6)=11.36 [0.077]*
White-noise	Q statistic=6.62 [0.357]	Q statistic=13.02 [0.043]**	Q statistic=5.76 [0.450]

Table 15: Summary of Estimation Results of North Korean Event Studies with GMM and Newey West
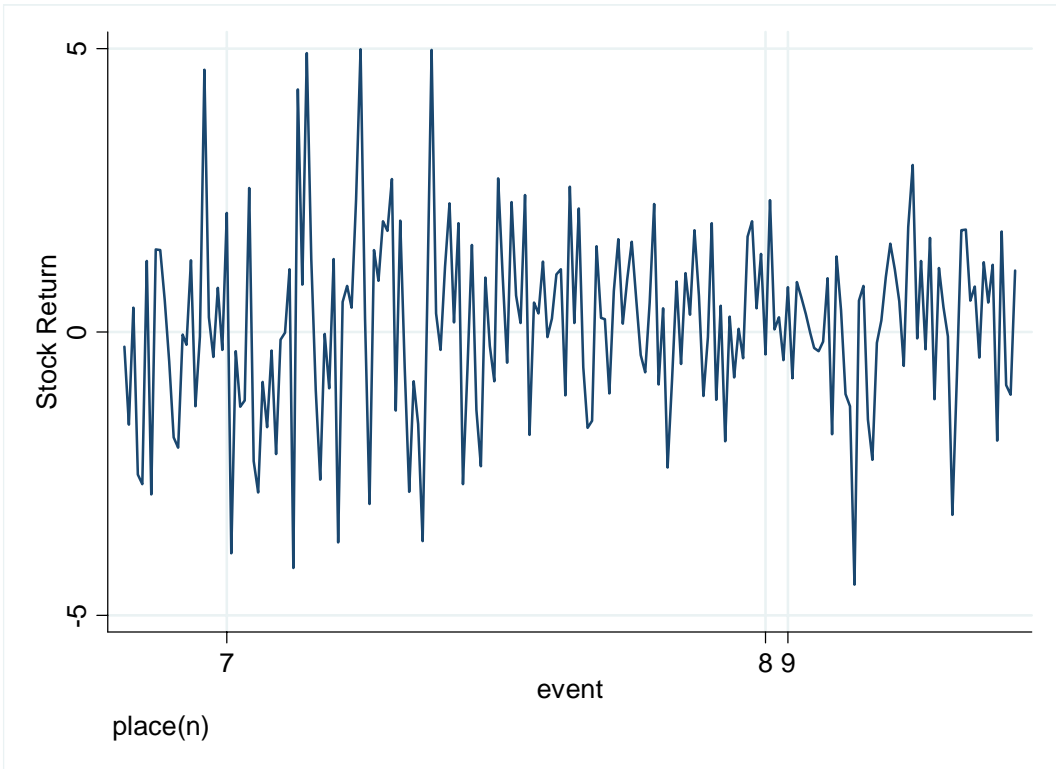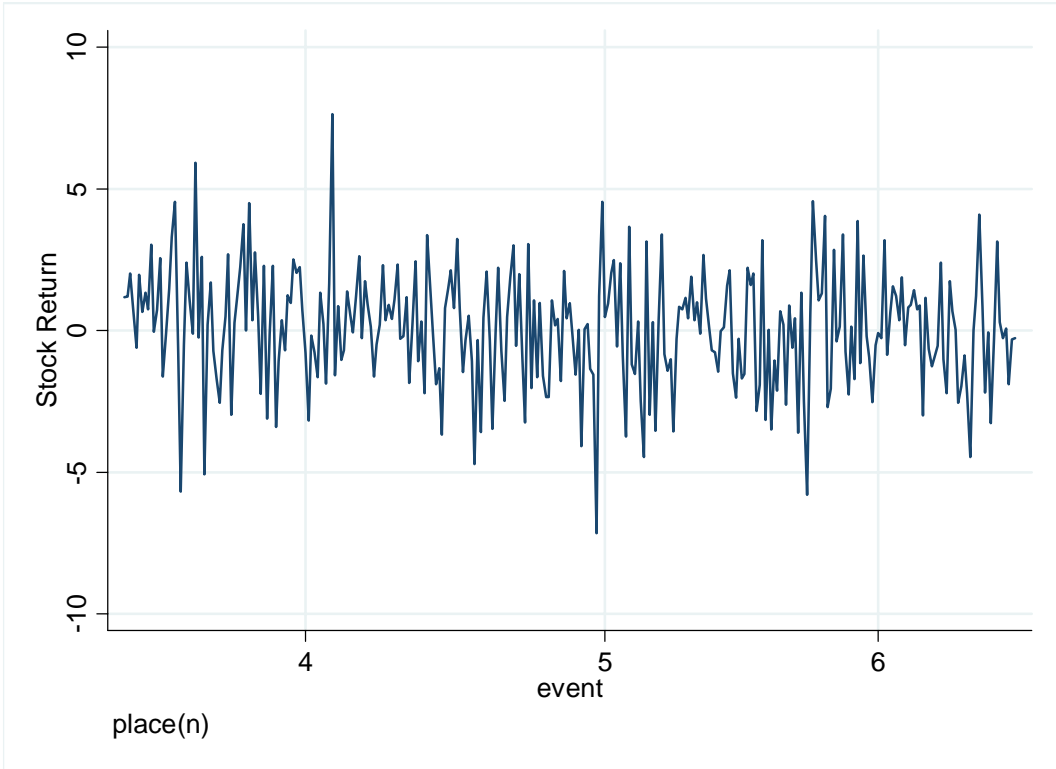
Event no.	Stock market return	Exchange rate (% change aginst USD)	Change in yield spread between US and S. Korea (treasury bill)
1	+***		-
2	-***		
3			
4		-	
5			
6			
7			
8			-
9			
10		-	
11			
12			
13	-	+***	
14			
15			
16			
17			
18			
19		+**	
20			
Number of significant events	3	4	2

APPENDIX.

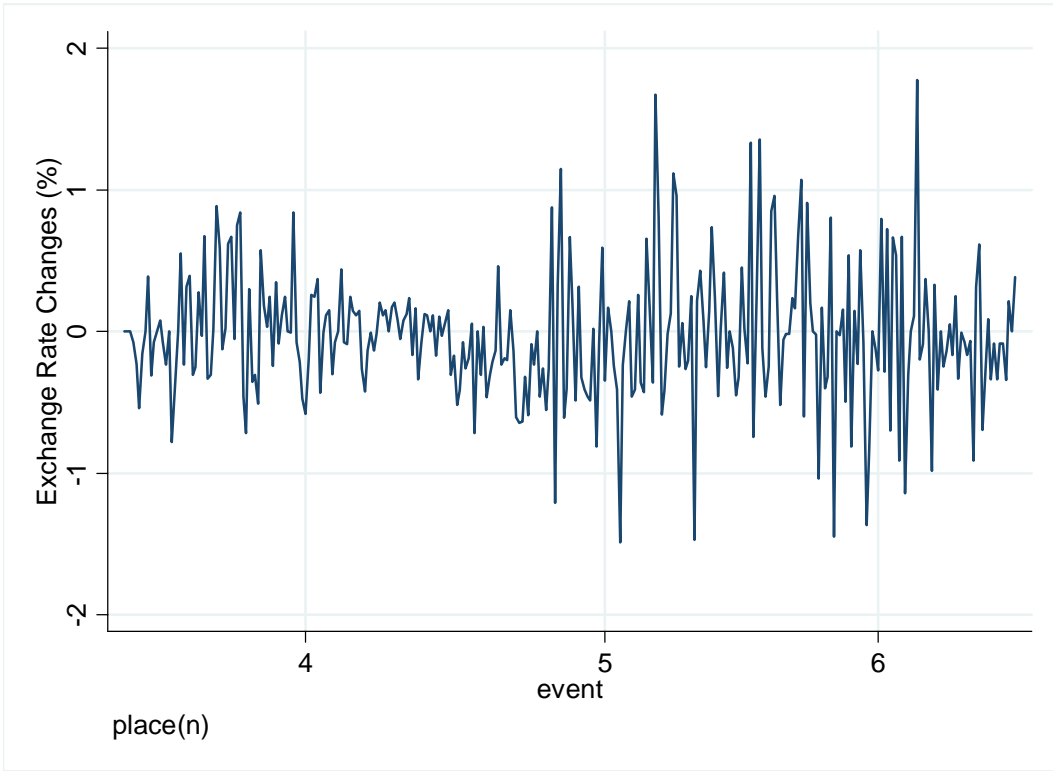FIGURE A1.
The Stock Market and North Korean events.

place(n)

place(n)

place(n)

place(n)

Stock Return

event

place(n)
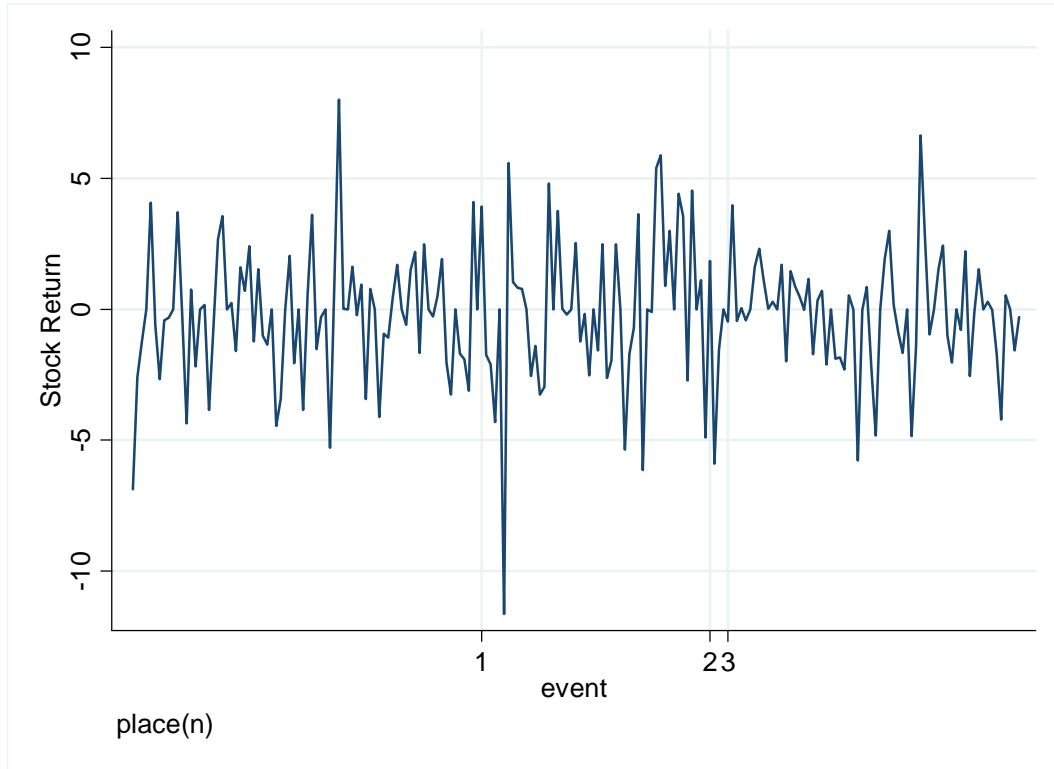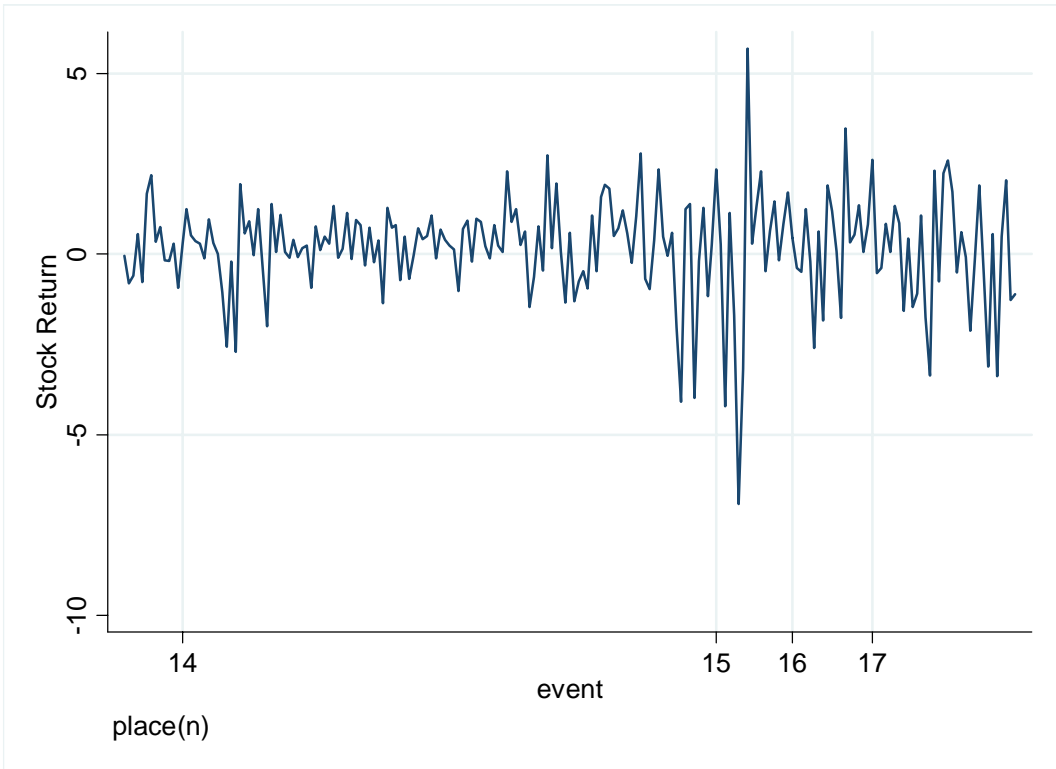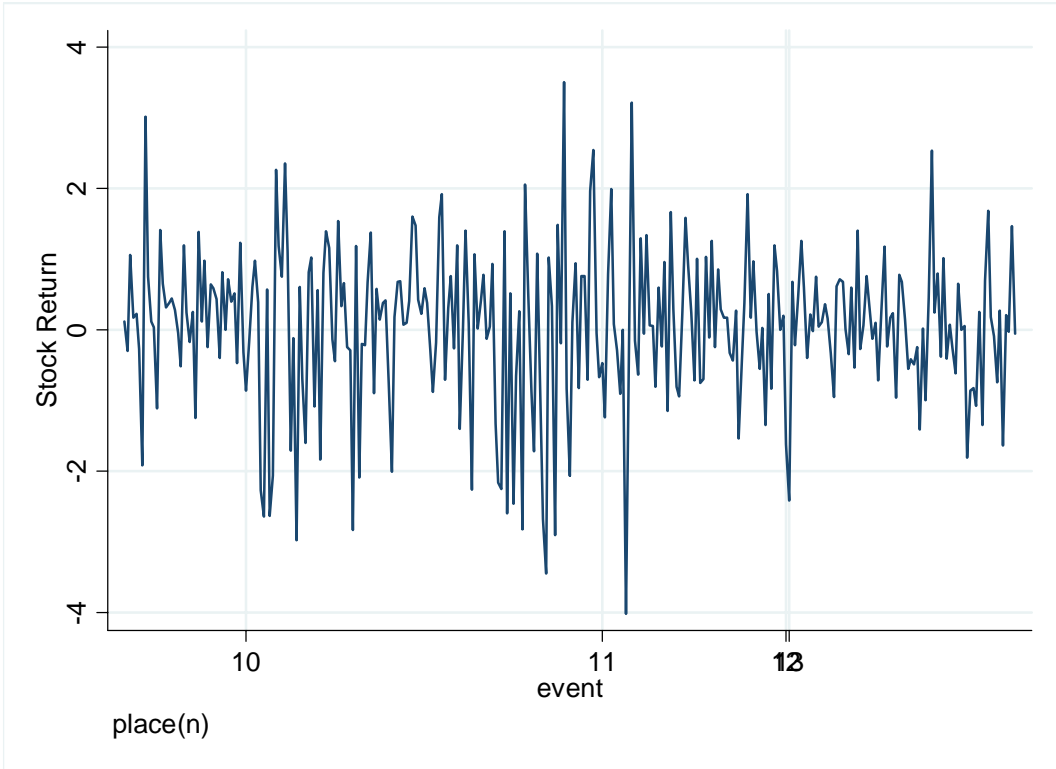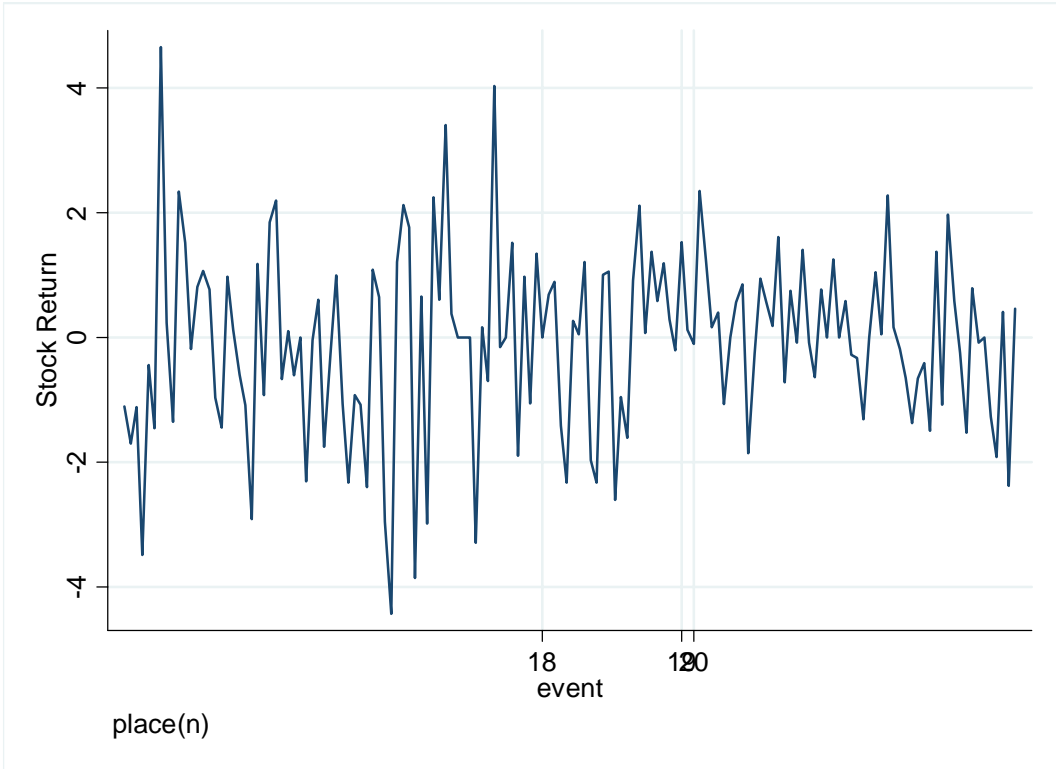
FIGURE A.2 The Exchange Rate and North Korean Events.
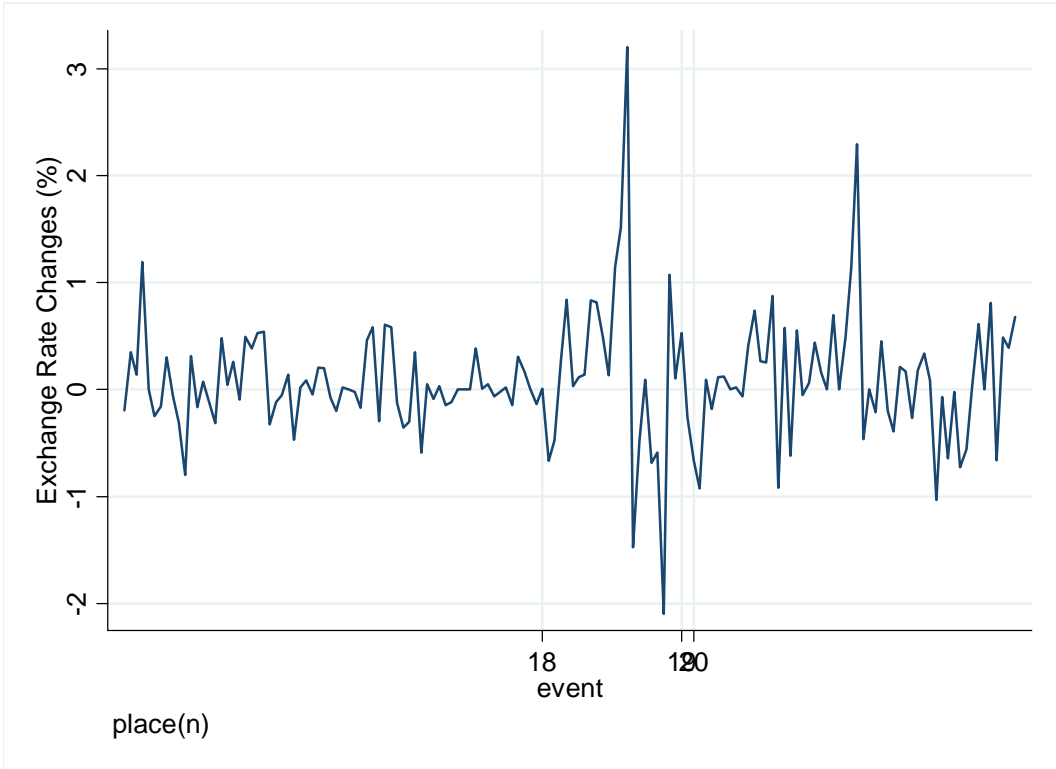

Exchange Rate Changes (%)

event

place(n)
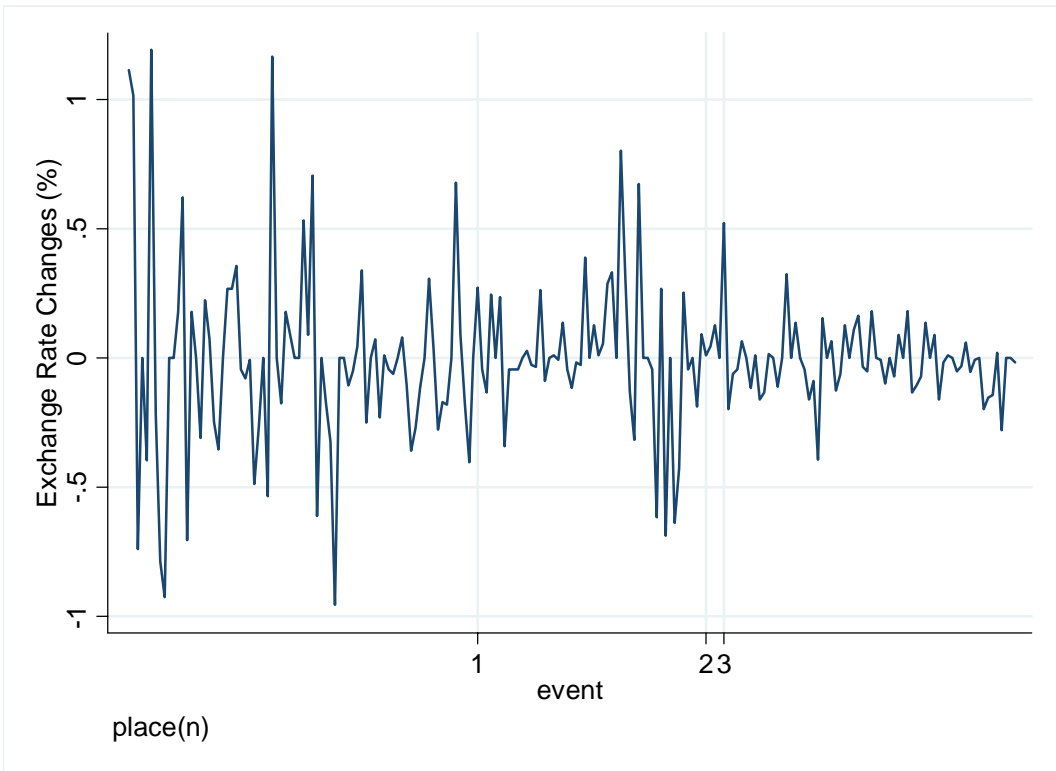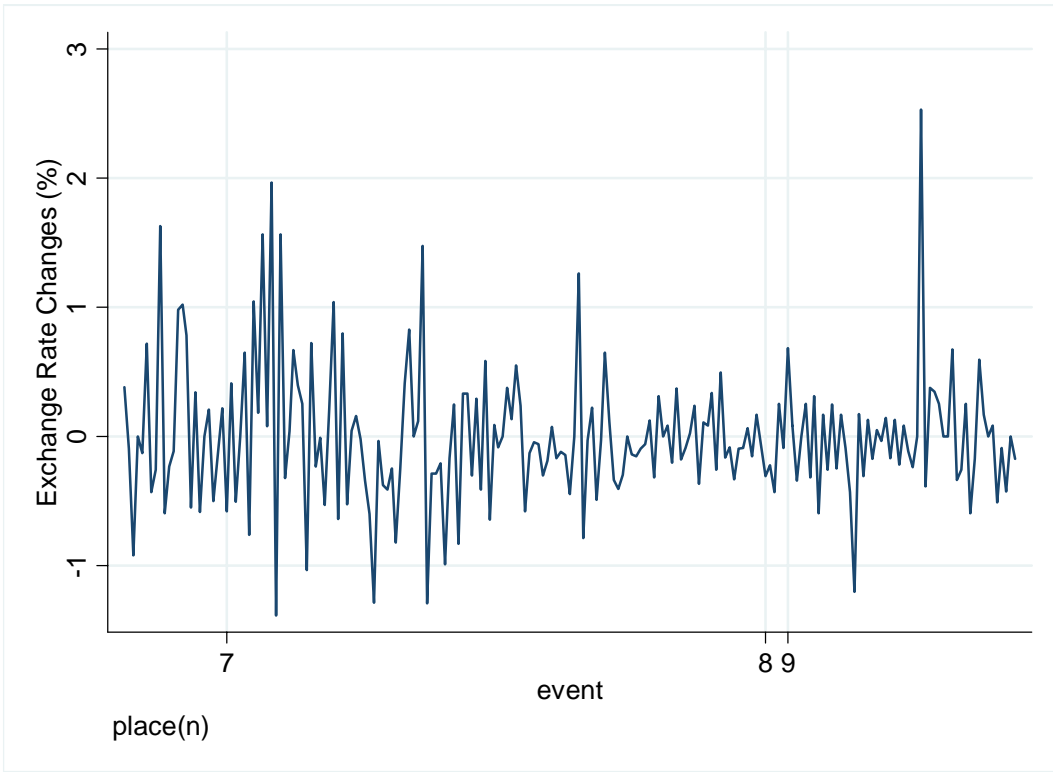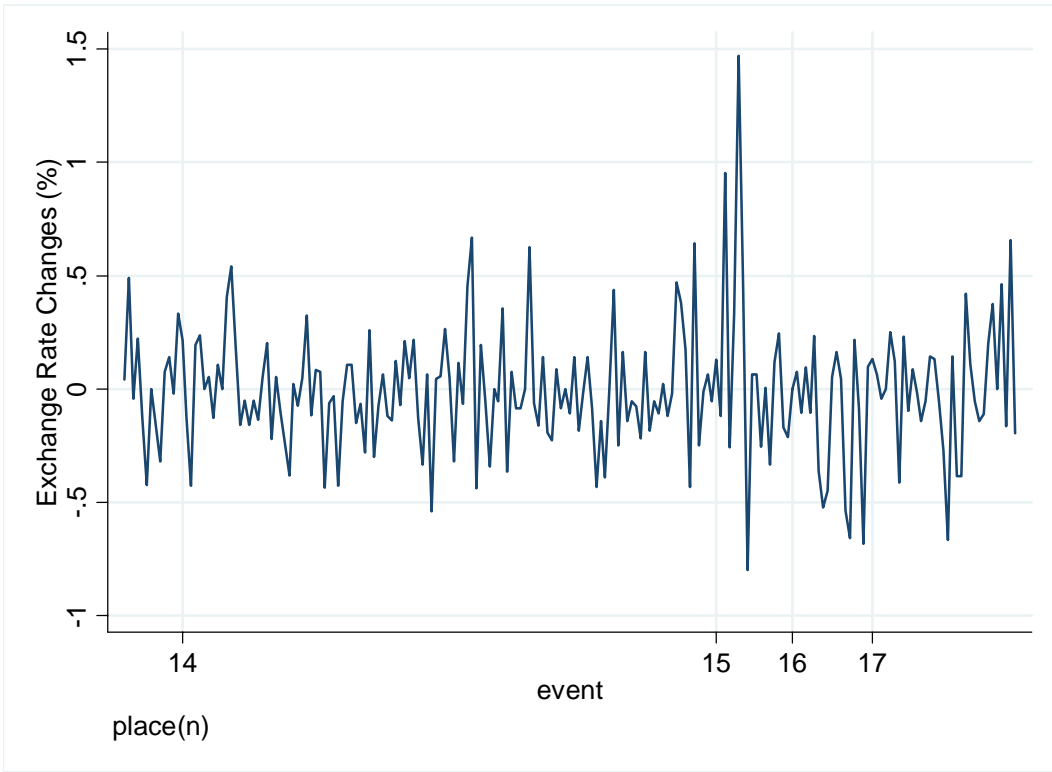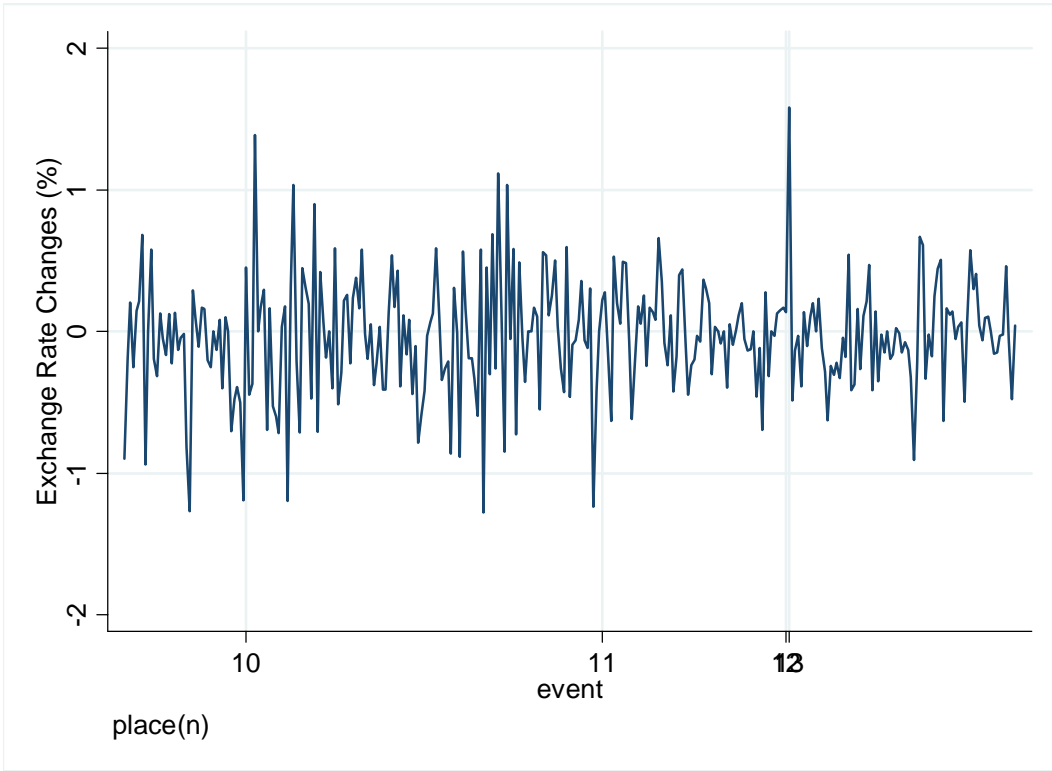
Figure A.3. The Bond Yield Spread and North Korean Events.