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How credible is the North Korean threat?[1]

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Abstract

We perform event analysis on particular episodes of tension in the Korean peninsula between 2000 and 2008, and investigate the effect of the events on South Korean financial markets (stock markets, bond yield spreads and the exchange rate) given that South Korea would be the first affected by a military aggression from North Korea. Surprisingly, 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. 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. Since financial markets often contain better predictions than expert opinions or surveys, these results strongly suggest that the North Korean threat is non-credible.

JEL classifications: D4, D84, G13, G14.
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1. Introduction

Attempts by the North Korean regime under Kim Jong-Il and his successor Kim Jong-Un to build an arsenal 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, the United States (US), China, Japan and Russia) that was put in place to deal with the North Korean threat has been frozen since 2008 and there is great uncertainty over how effective it can 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. The extremely aggressive and bellicose rhetoric of North Korean leaders and of the North Korean propaganda machine contains clear and open military threats towards South Korea. A nuclear strike from North Korea on Seoul could have catastrophic consequences. How credible are the North Korean military threats?

In this paper we use 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 engagement between the two Koreas on 29 June 2002 or of North Korea's conduct of a nuclear test on 9 October 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 Daejung in 1998, aiming at peaceful reconciliation between both Koreas.

The advantage of event studies is that they aggregate the views of financial markets on specific events: 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.[2] 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 value of political connections (Fisman, 2001), effectiveness of US policy in Iraq (Chaney, 2008; 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 *et al.*, 2011), the effect of civil war in Africa on diamond-mining firms (Guidolin and La Ferrara, 2007), detecting illegal arms trade (DellaVigna and La Ferrara, 2010) and others.

[2] 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, MacKinlay, 1997; Wolfers and Zitzewitz, 2004).

Financial markets in South Korea are sufficiently developed that they can be compared with the 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 usefully applied to South Korean financial markets.

We selected 26 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 most 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, and very often with the wrong sign. The most sensitive variable to events is the exchange rate, the least sensitive one is the bond yield spread and the stock market is somewhere in between. Foreign exchange rate effects are mostly non-significant or very small. The event that had the largest effect on the foreign exchange rate was the nuclear test that took place on 9 October 2006, but the Korean Won only lost 1.6 percent in that event window. The KOSPI increased by 3.9 percent when the announcement was made on 10 April 2000 that two leaders agreed to hold the first inter-Korean summit. Yet, for 2 days after the announcement, the KOSPI Index decreased by 3.8 percent. One of the significant events to affect the bond yield was the announcement on 8 August 2007 that leaders of both Koreas agreed to meet for the second time. The yield spread between Korean Treasury bonds and US bonds was reduced by 0.12 basis points in total on 1 day before and on the day the announcement was made. However, the yield spread increased by 0.19 basis points 1 day after the announcement. 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 or of easing of tension. This evidence suggests that South Korean financial markets do not perceive the North Korean threats as credible. As 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 essentially only 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 internal collapse. Second, any deadly strike against South Korea would face immediate retaliation from the

South Korean Army supported by the US and thus would lead to near immediate regime collapse. In other words, the credible retaliation by the USA–South Korea alliance would act as a deterrent to a North Korean aggression. 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 behaviour of the North Korean communist regime. The policy relevance of these results is thus quite obvious.

Equally important to note from our results is the fact that events that appear to reduce the tension between North and South, such as the first meetings between leaders from both sides, initiating the Sunshine policy, or important dates in the six-party talks including agreements on the process of denuclearization did not have a significant effect on financial markets either. This shows that, while North Korean threats are not perceived to be credible, promises of cooperation by the North are not credible either. North Korean leaders are thus perceived to be untrustworthy as political actors.

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 on 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 outlines our conclusions.

2. The empirical methodology

Event study methodology is useful to look at high frequency effects of particular events on financial markets. Standard event study methodology can be represented by the following specification:

$$y_t = \alpha + \beta' X + \sum_i \theta_i D_{k_i} + \varepsilon_t, \tag{1}$$

where y_t is a variable related to financial markets, X is a vector of control variables and D_{ki} is an indicator that is equal to 1 if the event of interest, k, occurs at time t. The above specification might be appropriate for an event whose effect starts and ends at time t. However, the effect of the event may be prolonged for more than one period. To capture the full effect of the event, one needs a specification that allows for an 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) over 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:

$$\begin{aligned} y_1 &= \alpha + \beta' X + CAR_1 + \varepsilon_t, \quad t = 1 \\ y_t &= \alpha + \beta' X + CAR_t - CAR_{t-1} + \varepsilon_t, \quad 2 \le t \le T. \end{aligned} \tag{2}$$

We 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 follows:

$$y_t = \alpha_0 + \beta_0' X + \sum_{t=-2}^{t=2} \theta_{kt} D_{k(T_k+t)} + \varepsilon_t, \tag{3}$$

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 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.

Equation (3) is used to estimate the return on the KOSPI Index, the exchange rate of the Korean Won against the US Dollars and the yield spread between US Treasury bills with 3 years maturity and Korean government bonds with the same maturity. If a negative event, like North Korea conducting nuclear tests or firing missiles, is perceived as significant and credible, it should negatively affect South Korean financial markets. Indeed, in line with standard finance theory, if such an event is perceived as conveying new information on a credible threat, it means that the probability of conflict has gone up, thus driving down the net present value of future earnings of South Korean companies, and thus negatively affecting their stock price around the time of the event. Similarly, if a positive event, likely to reduce the tension between North and South Korea, is perceived as conveying information on a credible improvement of relations between both Koreas, then this should positively affect stock prices around the time of the event.

To estimate the stock market return, we want to abstract from the effects of aggregate news or worldwide stock market variations. We therefore use the return on the Dow Jones Index as a control variable.[3] 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 roughly in the same 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

[3] We estimated the equation with and without the return on the Nikkei Index as a control variable to check the robustness of our results and found that this does not alter our main findings.

those on the New York stock exchanges, we used the return on this market as a control variable.[4]

We performed similar regressions for the exchange rate of the Korean Won against the US Dollar, controlling for the exchange rate between the Yen and the Korean Won.[5] Similarly, we ran regressions for the yield spread between US Treasury bills with 3 years maturity and Korean government bonds with the same maturity, controlling for the yield spread between corporate bonds of US companies having AAA according to Moody's rating and Korean corporate bonds with the same rating.[6]

3. Identification of events

We identified North Korean-related events using both the diary of daily events related to North Korea documented by the Ministry of Unification of the South Korean government as well as the events 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 used the following criteria for main events. First, to be qualified as a main event, it should be included in both document sources and have received an important treatment in newspapers as well as online. We checked whether a particular event was reported and discussed in major newspapers in South Korea. In addition, we counted the number of hits in Google search in Korean with the title of an event and the year it occurred, and we included only the events exceeding 100,000 hits.[7] Second, its effects 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 'event' date the earliest 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 that were independent from North Korean matters. However, we found no such major overlapping events.

[4] Considering that the performance of New York stock markets in day $t-1$ affects the KOSPI in day t, we use once-lagged return on the Dow Jones Index as a control variable.

[5] We also estimated a specification without controlling for the exchange rates between the Japanese Yen and the Korean Won. Again, this did not change our results.

[6] We also ran regressions without the yield spread of corporate bonds and found that this does not affect our key results.

[7] In the spirit of Saiz and Simonsohn (2008) and DellaVigna and La Ferrara (2009), we used counts of Google hits to check whether the events we identified are regarded as important by the public and whether we have been missing any important events.

Table 1 describes the identified North Korean-related events with their dates of occurrence. We further classified the above events into five categories: South–North Korean politics (South–North Korea political), US–North Korean politics (US–North Korea political), multilateral politics (multilateral political), military conflict (military) and signs of economic openness (open).[8] According to our classification, 5, 6, and 6 of 26 events are classified as South–North Korea political, US–North Korea political and multilateral political, respectively. Also, six events are categorized as military, and the remaining three as representing signs of economic openness. This diversity in the characteristics of the identified events makes it possible to test differential impacts of North Korea-related events, particularly the three types of political processes associated with North Korean events.

4. Estimation results of the effects of North Korea-related events

When estimating Equation (3) for the three financial markets using the events identified in the previous section, we introduce CAR dummies before the event to take into account possible expectation effects on the market. We also take into account the possibility that the effects of the event may take place with some delay, and thus also introduce CAR dummies after the event. We found that an event window of 5 days (two days before the event, the event day and two days after the event) is in general sufficient to capture possible pre- and post-event effects.

We estimate Equation (3) in two ways. First, we restrict the coefficients for each of the 26 events to be equal, and jointly estimate the effects of all events on each of the three financial markets. In other words, we construct CAR dummies to be the same across all the events at a given time point in the event window. Hence, the results from these estimations show the aggregate effects of the events on financial markets. These results are presented in Table 2. As can be seen, the joint test of all CAR variables being zero is accepted in all three financial markets, and there are no significant aggregate effects of North Korean-related events on any of South Korean financial markets except CAR_{t-2} affecting the stock market. These results suggest that South Korean financial markets are little affected by North Korean-related events.

However, this estimation method may be too aggregated to identify possible differentiated effects of individual events. Hence, we also estimate separately the effects of the 26 individual events on each of the three financial markets. Table 3 summarizes the overall estimation results when putting together all the events in one regression. We do not report the 390 different coefficients and their standard errors, but report only whether or not there was a significant effect of the event by showing the results from the joint exclusion tests of the five CAR dummies. The *F*-test statistic is reported for each event and the associated *p*-value is given in brackets. We also report whether the event positively or negatively affects the Korean

[8] We thank a referee for the suggestion of this detailed classification of political processes.

Table 1. Identification of main events and their types

Event	Description	Date	Type
1	Two Koreas agree to first meeting of their leaders	10 April 2000	South–North Korea political
2	First South and North Korean Summit	14 June 2000	South–North Korea political
3	Washington eases sanctions against N. Korea	19 June 2000	USA–North Korea political
4	Albright, US Secretary of State, visits N. Korea	23 October 2000	USA–North Korea political
5	Bush's axis of evil speech	29 January 2002	USA–North Korea political
6	Northern Limit Line (NLL) West Sea naval engagement	2 July 2002*	Military
7	Kelly, US Assistant Secretary of State, visits N. Korea	4 October 2002	USA–North Korea political
8	US announces N. Korea admitted a secret nuclear arms programme	17 October 2002	USA–North Korea political
9	N. Korea announces Kumgang-san as tourist region	13 November 2002	Open
10	N. Korea withdraws Treaty on the Non-proliferation of Nuclear Weapons (NPT)	10 January 2003	Multilateral political
11	N. Korea's launching of an anti-ship cruise missile	24 February 2003	Military
12	Three countries (US, South and North Korea) have a meeting in Beijing	23 April 2003	Multilateral political
13	Agreement of inter-Korean economic cooperation	20 August 2003	Open
14	First round of the six-party talks in Beijing	27 August 2003	Multilateral political

Table 1. (Continued)

Event	Description	Date	Type
15	Second round of the six-party talks	25 February 2004	Multilateral political
16	Joint statement of the six-party talks issued	20 September 2005**	Multilateral political
17	Unofficial visit to China by Kim Jong-Il	10 January 2006	Open
18	N. Korea test-fires 7 missiles	5 July 2006	Military
19	N. Korea pledges to test nuclear bomb	4 October 2006†	Military
20	N. Korea conducts nuclear test	9 October 2006	Military
21	Two Koreas agree to second meeting of their leaders	8 August 2007	South–North Korea political
22	N. Korea agrees to declare and disable all nuclear facilities	3 September 2007‡	Multilateral political
23	Second South and North Korean Summit	2 October 2007	South–North Korea political
24	New York Philharmonic Live from N. Korea	26 February 2008	USA–North Korea political
25	N. Korea conducts missile tests	28 March 2008	Military
26§	N. Korea singles President Lee out for criticism§	1 April 2008	South–North Korea political

***Notes*:** *NLL West Sea Naval Engagement occurred on Saturday 29 June 2000 and the following Monday, 1 July 2000 was a public holiday. This led us to record 2 July 2000 as the event day. **The Joint Statement was issued on 19 September 2005, which was a public holiday in South Korea, and thus the following day, 20 September 2005, was recorded as the event day. †North Korea pledged to test nuclear weapon on 3 October 2006, which was a public holiday in South Korea, and thus the following day, 4 October 2006, was recorded as the event day. ‡North Korea agreed to declare and disable all her nuclear facilities on 1 September 2007, but US financial markets were closed on this day, and thus we recorded 3 September 2007 as event day. §This event was included in neither of the diaries. Nevertheless, mass media and the public regarded this criticism as a signal to the new South Korean government that future relations between the two Koreas would deteriorate.

Table 2. Effects of North Korean events on financial markets (aggregated)

	Stock markets		Currency markets		Bond markets	
CAR_{t-2}	0.518	0.731	−0.029	−0.018	−0.006	−0.014
	(1.87)*	(2.28)**	(0.34)	(0.20)	(0.62)	(0.86)
CAR_{t-1}	0.526	0.708	−0.131	−0.113	−0.004	−0.012
	(1.38)	(1.60)	(1.11)	(0.94)	(0.26)	(0.51)
CAR_t	0.456	0.675	−0.099	−0.062	0.008	−0.007
	(0.97)	(1.24)	(0.68)	(0.43)	(0.46)	(0.25)
CAR_{t+1}	0.486	0.806	−0.097	−0.036	0.006	−0.022
	(0.86)	(1.24)	(0.56)	(0.21)	(0.29)	(0.65)
CAR_{t+2}	0.211	0.497	−0.103	−0.058	−0.000	−0.032
	(0.33)	(0.66)	(0.52)	(0.29)	(0.00)	(0.81)
Control	Dow Jones	Dow Jones	Won–Yen	No control	Corporate	No control
variables	0.219	0.476	−0.100		Spread	
	(7.21)***	(14.2)***	(7.15)***		0.994	
	Nikkei				(60.5)***	
	0.637					
	(27.2)***					
Joint test (Null:	0.93	1.27	0.33	0.33	0.40	0.35
All CARs = 0)	[0.460]	[0.274]	[0.896]	[0.896]	[0.850]	[0.884]

Notes: Absolute *t*-values are reported in parentheses. *p*-values are in parentheses. ***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

Table 3. Summary of the results of exclusion tests of North Korean events

Event no.	Stock market return (growth in % of the KOSPI Index)	Exchange rate (% change against USD)	Change in yield spread between USA and S. Korea (treasury bill)
1	3.16 [0.01]*** (positive – expected sign)	0.30 [0.92]	1.19 [0.31]
2	4.59 [0.00]*** (negative – unexpected sign)	0.06 [0.99]	0.44 [0.82]
3	1.16 [0.33]	0.29 [0.92]	0.62 [0.69]
4	3.36 [0.01]*** (positive – expected sign)	1.27 [0.27]	0.40 [0.85]
5	0.69 [0.63]	0.74 [0.60]	1.06 [0.38]
6	1.66 [0.14]	0.53 [0.75]	0.1 [0.85]
7	1.52 [0.18]	1.52 [0.18]	0.41 [0.84]
8	2.07 [0.07]* (positive – unexpected sign)	1.56 [0.17]	2.13 [0.06]* (positive – unexpected sign)
9	0.79 [0.55]	0.74 [0.59]	0.86 [0.51]
10	1.25 [0.28]	0.19 [0.97]	1.03 [0.91]
11	0.89 [0.49]	0.89 [0.49]	0.05 [1.00]
12	1.83 [0.10]	3.16 [0.01]*** (negative – unexpected sign)	0.30 [0.91]
13	0.50 [0.78]	0.30 [0.91]	1.17 [0.32]
14	0.14 [0.98]	0.63 [0.68]	0.74 [0.59]
15	0.53 [0.76]	2.02 [0.08]* (negative – unexpected sign)	0.11 [0.99]

Table 3. (Continued)

Event no.	Stock market return (growth in % of the KOSPI Index)	Exchange rate (% change against USD)	Change in yield spread between USA and S. Korea (treasury bill)
16	0.21 [0.96]	0.28 [0.92]	0.41 [0.84]
17	0.24 [0.94]	1.78 [0.11]	0.02 [1.00]
18	0.17 [0.97]	0.31 [0.91]	0.02 [1.00]
19	0.92 [0.47]	2.94 [0.02]** (negative – expected sign)	0.24 [0.94]
20	0.94 [0.45]	2.51 [0.03]** (negative – expected sign)	0.27 [0.93]
21	0.99 [0.42]	1.21 [0.30]	2.31 [0.04]** (positive – expected sign)
22	0.31 [0.91]	0.17 [0.97]	0.29 [0.92]
23	0.34 [0.89]	0.50 [0.78]	1.00 [0.42]
24	0.18 [0.97]	0.57 [0.72]	0.81 [0.54]
25	0.30 [0.91]	1.93 [0.09]* (negative – expected sign)	2.42 [0.03]** (negative – expected sign)
26	0.47 [0.80]	2.26 [0.05]** (positive – unexpected sign)	2.07 [0.07]* (positive – unexpected sign)
No. of jointly significant events	4	6	4

Table 3. (Continued)

Event no.	Stock market return (growth in % of the KOSPI Index)	Exchange rate (% change against USD)	Change in yield spread between USA and S. Korea (treasury bill)
No. of jointly significant events with expected effects	2	3	2

Notes: We report an event as significant if CAR dummies in the event window are jointly significant. When it is significant, we report whether it had a positive or a negative impact on the financial market considered. In addition, we look at whether the sign on the CAR coefficients is consistent with the nature of the events. We report the (un)expected sign when they are (in)consistent. We use return on the Dow Jones Index as a control variable for the equation on the Korean stock market return; the exchange rate between the Japanese Yen and the Korean Won in the equation for the exchange rate between the US dollar and the Korean Won; and changes in the corporate bond yield spread for the equation of changes in yield spread between US Treasury bills and Korean government bonds. Regarding Events 19 and 20, three CARs up to 9 October 2006 overlap. Events 25 and 26 occurred on 28 March 2008 and 1 April 2008, respectively. As a consequence, some days overlap in the estimations causing drops for some CARs. We estimated overlapping CAR dummies by deleting relevant events in turn. We report the exclusion test results by dropping overlapped event dummies. For example, for Event 19, we report the test result of a regression dropping CAR dummies related to Event 20. As for Event 20, we report the test result of a regression dropping the five CAR dummies related to Event 19. As regards Event 21 in the equation for change in yield spread, the effects of the event on the bond market are positive for 2 days, t and t+1, but negative for the other days. Considering the effect on t and t+1 which appears to be more important, we report the overall effect as positive. The asterisk next to the sign denotes that the five CAR variables relative to the event jointly significant. ***Significant at 1% level. **Significant at 5% level. *Significant at 10% level. The F-statistic of the exclusion test is provided for each event. p-values are in parentheses.

financial markets when the five event-related CAR variables are jointly significant at least at the 10 percent significance level.[9] In addition, the last row of the table shows the number of significant events whose effects are in line with the nature of the events.

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. Fourteen of seventy-eight event variables (26 times 3 dependent variables) turned out to be jointly significant at the 10 percent significance level. However, only seven events have an effect going in the direction consistent with our expectations, suggesting that the effects of the remaining seven significant events are not purely related with the events themselves, but mixed with other factors affecting financial markets. In other words, only seven events related to North Korea influence any of the three South Korean financial markets. In terms of the number of significant events, foreign currency markets appear to be the most sensitive to the North Korea-related events. They reacted negatively to news about the North Korean nuclear test (Events 19–20) and missile test (Event 25) and to the events relating to the talk of three countries in Beijing (Event 12) and to the second round of the six-party talks (Event 15), and positively to the criticism of the then newly elected South Korean President Lee Myungbak (Event 26). Among these, only the effects of Events 19, 20 and 25 are in line with expectations on whether the relevant events should affect the foreign currency market positively or negatively. Hence, there are only three significant effects that were caused by the events themselves.

The stock market was significantly affected four times: first, by the announcement of the 1st inter-Korean summit (Event 1) and later, when the summit was actually held (Event 2). In addition, US Secretary of State, Albright's visit to North Korea (Event 4) and the US announcement of North Korea's admittance of a secret nuclear arms programme (Event 8) are associated with an increase in CAR in the South Korean stock market. Among these, however, the actual effects of Events 2 and 8 are not consistent with the direction one would expect, suggesting that the changes in CAR are not caused by the North Korean events. The bond market was affected four times as well: The US announcement of North Korea's admittance of a secret nuclear arms programme (Events 8), the agreement of the two Koreas on the second summit (Event 21) and the criticism of the then newly elected South Korean President Lee

[9] We performed some diagnostic tests. These suggest that there are some problems in the residuals. 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 the optimal weighting matrix are used as well. As regards the bond spread, we used Korean–US exchange rates and the Dow Jones Index as external instruments for the corporate bond spread between the US and South Korea. In a similar way, the exchange rate between the Euro and the Won and the return on the Dow Jones Index are used as external instruments for the exchange rate between the Yen and the Won and the return on the Nikkei Index, respectively. The results, which are available upon the request, are similar to those reported in Table 3.

Myungbak (Event 26) affected the Korean bond market positively and the missile test (Event 25) negatively. However, there were only two events that affected the bond market according to our expectation on the sign of the coefficients: The agreement of the two Koreas on the second summit (Event 21) and the announcement that North Korea conducts missile tests (Event 25). To summarize, it would appear that among all important events selected, the events related to the inter-Korean Summits between the two leaders and Albright's visit to North Korea had significant effects on the stock market while the North Korean nuclear and missile tests had a significant effect either on the foreign currency market or on both the foreign currency and the bond markets. However, even with these significant events, the effects on the markets are often neither large nor sustained as we will explain in more detail later in this paper.

The most important conclusion to be drawn from Tables 2 and 3 is that financial markets in South Korea have not really been affected by events related to North Korea. In other words, markets consider the North Korean threat not to be credible. The positive effect on stock markets of the announcement of the first North–South Korean Summit can easily be interpreted as expectations of more business opportunities with North Korea rather than as representing a reduction in the North Korean threat. Moreover, the fact that the North Korean nuclear test had a significant effect only on the exchange rate could be explained by financial transactions involving foreign agents, possibly of a speculative nature. Moreover, the foreign currency market is relatively shallow in Korea compared to the other two markets, suggesting they might be swayed easily by some large players.[10] Otherwise, stock and bond markets would also be affected.

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 therefore do not report results for all events, but focus instead on five events that have important implications for South Korea.

Table 4 shows the estimates for the announcement of the first summit between the two Koreas on 10 April 2000. Even though the announcement was unexpected, some information must have leaked: The delegates of the two Koreas agreed to hold the summit at a confidential meeting in Beijing. Our data show that there are significant cumulative abnormal returns in the days before the announcement. On the day of the announcement, there is an 8.1 percent cumulative abnormal return. This looks like a rather large number. However, if we look at the raw numbers, the effect does not seem large in comparison to the volatility of the KOSPI Index. The KOSPI Index increased by 3.9 percent on the day of the announcement of the first summit. However, this positive effect subsided when the first summit actually took place: The KOSPI decreased by 10.2 percent during the event window, while it increased by

[10] Korean stock markets rank 14th in the world in terms of size. In contrast, the number of daily transactions in Korean foreign exchange markets is about 15 percent of those of countries whose stock market has a similar size to Korean one.

Table 4. Effects of the announcement of the first Korean summit (event 1)

	Stock market return (KOSPI Index)	Exchange rate (% change against USD)	Change in yield spread between USA and South Korea (treasury bill)
CAR_{t-2}	4.287 (2.56)**	−0.386(0.86)	−0.110 (2.06)**
CAR_{t-1}	4.265 (1.80)*	−0.488 (0.77)	−0.111 (1.47)
CAR_t	8.147 (2.80)***	−0.201 (0.26)	−0.101(1.09)
CAR_{t+1}	6.055 (1.80)*	−0.361 (0.40)	−0.052 (0.49)
CAR_{t+2}	3.485 (0.93)	−0.533 (0.53)	−0.003 (0.02)

Notes: Absolute *t*-values are in parentheses. ***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

4.1 percent when the agreement on the summit was announced. The bond yield spread also went down 2 days before the summit by a 10th of a percentage point, but did not move subsequently.

In Table 5, we can see the effects of the US announcement of North Korea's admittance of a secret nuclear arms programme on 17 October 2002. However, the stock market index rose 1 day after the announcement and the Korean currency appreciated significantly at the 10 percent significance level on 2 days inside the event window. In addition, the yield spread between US Treasury bills and Korean government bonds decreased instead of increasing. These indicate that the effects are not genuinely associated with the event. A similar conclusion can be drawn from

Table 5. US announcement of North Korea's admittance of a secret nuclear arms programme (Event 8)

	Stock market return (KOSPI Index)	Exchange rate (% change against USD)	Change in yield spread between USA and South Korea (treasury bill)
CAR_{t-2}	2.293 (1.37)	−0.056 (0.12)	−0.131 (2.45)**
CAR_{t-1}	1.044 (0.44)	−1.107 (1.74)*	−0.052 (0.68)
CAR_t	3.593 (1.24)	−0.960 (1.23)	−0.062 (0.67)
CAR_{t+1}	6.202 (1.84)*	−1.508 (1.68)*	−0.043 (0.40)
CAR_{t+2}	3.196 (0.85)	−1.884 (1.87)*	−0.124 (1.03)

Notes: Absolute *t*-values are in parentheses. ***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

Tables 6 and 7: The North Korean test of an anti-ship cruise missile on 24 February 2003 and the joint statement of the six-party talks have no effects on the Korean financial markets. Table 8 shows that the nuclear test conducted in North Korea on 9 October 2006 appears to have a negative effect on the stock market the same day, but it is not statistically significant. We, however, do observe a significant increase in the exchange rate on that date: The Korean currency depreciated by 1.58 percent.

We also 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 exports fertilizers to North Korea. Shinwon is a clothes-producing company that built a factory in the Gaesung Industrial Complex in North Korea in October 2004 and began to produce clothes there in early 2005. Kwang

Table 6. Effects of testing an anti-ship cruise missile (Event 11)

	Stock market return (KOSPI index)	Exchange rate (% change against USD)	Change in yield spread between USA and South Korea (treasury bill)
CAR_{t-2}	0.984 (0.59)	−0.137 (0.30)	0.010 (0.18)
CAR_{t-1}	1.142 (0.48)	0.093 (0.15)	0.008 (0.11)
CAR_t	2.593 (0.89)	−0.531 (0.68)	0.018 (0.19)
CAR_{t+1}	−0.397 (0.12)	−0.067 (0.07)	−0.003 (0.02)
CAR_{t+2}	−1.076 (0.29)	−0.532 (0.53)	−0.013 (0.11)

***Note*:** Absolute *t*-values are in parentheses.

Table 7. Effects of joint statement of the six-party talks (Event 16)

	Stock market return (KOSPI Index)	Exchange rate (% change against USD)	Change in yield spread between USA and South Korea (treasury bill)
CAR_{t-2}	0.100 (0.06)	−0.023 (0.05)	0.039 (0.73)
CAR_{t-1}	0.392 (0.17)	0.427 (0.67)	0.029 (0.38)
CAR_t	1.416 (0.49)	0.412 (0.53)	−0.011 (0.12)
CAR_{t+1}	2.578 (0.77)	0.145 (0.16)	−0.012 (0.11)
CAR_{t+2}	3.288 (0.88)	0.223 (0.22)	−0.031 (0.10)

***Notes*:** Absolute *t*-values are in parentheses.

Table 8. Effects of conducting a nuclear test (Event 20)

	Stock market return (KOSPI index)	Exchange rate (% change against USD)	Change in yield spread between USA and South Korea (treasury bill)
CAR_{t-2}	0.330 (0.20)	0.145 (0.32)	0.020 (0.37)
CAR_{t-1}	−1. 285 (0.54)	0.311 (0.49)	0.039 (0.52)
CAR_t	−4.462 (1.54)	1.828 (2.35)**	0.028 (0.30)
CAR_{t+1}	−3.845 (1.15)	1.444 (1.61)*	−0.023 (0.21)
CAR_{t+2}	−4.133 (1.10)	1.272 (1.27)	0.003 (0.03)

Notes: Absolute *t*-values are in parentheses. ***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

Myung 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 9, 23 and 24 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 9–10 look at the four selected events (Events 1, 6, 11 and 20) for these three companies. 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 percent 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 either on financial markets in South Korea or on individual firms heavily engaged in business with North Korea.

Using the classification of the events according to their characteristics described in Table 1, we tested whether there is any significant difference in the effects of the five types of events (South–North political, US–North Korea political, multilateral political, military factors and openness). We also divided the events into partially expected and unexpected events, and positive and negative effects. We define as unexpected events those for which the Korean newspapers did not publish reports, information or rumours prior to their occurrence. We found that the following four events were unanticipated according to that definition: Bush's axis of evil speech, the NLL naval engagement in West Sea, North Korea's admittance of a secret nuclear arms programme and the unofficial visit of Kim Jong-Il to China. Note that while the others were partially expected, there was also uncertainty as to what would really

Table 9. Stocks of individual companies: Effects of the announcement of the first South–North Korean summit (Event 1) and of the West Sea naval engagement (Event 6)

	Event 1			Event 6		
	Namhae Chemical	Shinwon	Kwang Myung E.	Namhae Chemical	Shinwon	Kwang Myung E.
CAR_{t-2}	−1.722	−0.014	14.11	−2.391	13.27	7.301
	(0.51)	(0.00)	(0.54)	(0.70)	(0.13)	(0.28)
CAR_{t-1}	−1.841	−2.259	13.24	−2.584	29.63	15.28
	(0.38)	(0.02)	(0.36)	(0.54)	(0.21)	(0.41)
CAR_t	9.492	14.05	27.62	−4.056	27.30	22.33
	(1.61)	(0.08)	(0.61)	(0.69)	(0.16)	(0.49)
CAR_{t+1}	11.743	4.93	30.61	−4.063	27.52	22.89
	(1.73)*	(0.02)	(0.58)	(0.60)	(0.14)	(0.43)
CAR_{t+2}	9.469	4.42	25.96	−3.386	41.68	22.60
	(1.25)	(0.02)	(0.44)	(0.45)	(0.18)	(0.38)

***Notes*:** Absolute *t*-values are in parentheses. ***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

Table 10. Stocks of individual companies: Effects of the North Korean test of an anti-ship cruise missile (Event 11) and of North Korea conducting a nuclear test (Event 20)

	Event 11			Event 20		
	Namhae Chemical	Shinwon	Kwang Myung E.	Namhae Chemical	Shinwon	Kwang Myung E.
CAR_{t-2}	−2.447	−2.820	−1.698	0.315	−2.055	−0.859
	(0.72)	(0.03)	(0.06)	(0.09)	(0.02)	(0.03)
CAR_{t-1}	−2.290	−9.307	0.949	−0.422	−8.583	−5.838
	(0.48)	(0.07)	(0.03)	(0.09)	(0.06)	(0.16)
CAR_t	−1.738	−6.857	0.217	−8.598	−27.93	−20.76
	(0.30)	(0.04)	(0.00)	(1.46)	(0.12)	(0.46)
CAR_{t+1}	−3.342	−16.73	−6.043	−6.771	−24.17	−13.52
	(0.49)	(0.08)	(0.11)	(1.00)	(0.12)	(0.26)
CAR_{t+2}	−1.451	−16.51	−6.037	−6.250	−26.30	−14.41
	(0.19)	(0.07)	(0.10)	(0.82)	(0.12)	(0.24)

***Note*:** Absolute *t*-values are in parentheses.

happen. For example, the first meeting between the leaders of both Koreas was expected, but it was not known in advance how the meeting would go. A similar reasoning can be applied to other events. Finally, we regrouped the events according to their expected effects on financial markets and tested whether each group of events is significant. This can help to understand if there is any asymmetry in the effects on the markets. For instance, market participants react more significantly to negative news on North Korea rather than to positive news. We ran joint tests of the significance of the different classes of events. The results are shown in Table 11.

Again, apart from South–North Korea political events, all other events are not significant and the political events only affect the stock market return. Neither multilateral political processes including the six-party talks nor the US–North Korea political events significantly affect South Korean financial markets.[11] On the basis of the identification of the events and their individual effects, we find that the statistical significance of the South–North Korea political events is caused by the events associated with the first summit of the two Korean leaders held in 2000. However, the significance of the South–North Korea political effects related to the first summit (Events 1 and 2) might not reflect a reduction or increase in the North Korean threat, but more simply changes in the expectation of profits from more business with the North. Moreover, the events related to the second summit held in 2007 (Events 21 and 23) are not robustly significant. These findings indicate that not only the events directly caused by North Korea but also the events associated with political processes reducing the tension with North Korea do not exert any influence on South Korean financial markets. In other words, participants in the financial markets do not perceive that these political processes can successfully defuse the North Korean threat. As regards the effects of (un)expected events, neither the unexpected nor the partially expected events have any significant effect when pooled together. The same applies to events whose effects are expected to be positive or negative.

One question one may ask is how events related to North Korea compare to other events in South Korea not related to North Korea and their effects on financial markets. If other events affect financial markets, this may help put into clear perspective our results on the absence of effects of North Korean events on South Korean financial markets. We thus contrast events relative to North Korea with a pure South Korean-related event. From 1997 to the early 2000s, substantial restructuring programmes were carried out to overcome the 1997 financial crisis caused mainly by heavy borrowing of Korean companies from abroad. We identified one event concerning Korean big businesses during this period. The KOSPI Index dropped by 8 percent in 18 September 2000, mainly because of a sharp decrease in the price of a semi-conductor chip, which was an important Korean export item. A report that the

[11] We tested whether the events specifically related to six-party talks (Events 14, 15 and 16) are significant and found that they are not (the *p*-values of the associated *F*-test statistics are 0.83, 0.65 and 0.84, for stock market, foreign currency market and bond market, respectively). On this basis, we presume that the breakdown of the six-party talks since 2008 did not affect the South Korean financial markets as well.

Table 11. Joint tests for significance of groups of events

Events	Categories	Stock market return	Exchange rate (% change against USD)	Change in yield spread between USA and South Korea (treasury bill)
Types	South–North Korea political	F(5. 2138) = 2.22 [0.05]**	F(5, 2154) = 0.71 [0.6134]	F(5, 2145) = 0.41 [0.8386]
	US–North Korea political	F(5, 2138) = 1.28 [0.2679]	F(5, 2154) = 0.97 [0.4335]	F(5, 2145) = 0.82 [0.5376]
	Multilateral political	F(5, 2138) = 0.32 [0.9018]	F(5, 2154) = 0.62 [0.6848]	F(5, 2145) = 0.38 [0.8623]
	Military	F(5, 2138) = 0.84 [0.5188]	F(5, 2154) = 1.57 [01660]	F(5, 2154) = 0.43 [0.8255]
	Open	F(5, 2138) = 0.36 [0.8740]	F(5, 2154) = 1.03 [0.3400]	F(5, 2145) = 1.09 [0.3662]
Expected	Partially expected	F(5, 2138) = 1.10 [0.3591]	F(5, 2154) = 0.23 [0.9484]	F(5, 2145) = 0.77 [0.9739]
	Unexpected	F(5, 2138) = 1.04 [0.3901]	F(5, 2154) = 1.57 [0.1649]	F(5, 2145) = 1.49 [0.1895]
Positive or negative	Positive effects	F(5, 2139) = 0.69 [0.6288]	F(5, 2154) = 0.30 [0.9143]	F(5, 2145) = 0.33 [0.8979]
	Negative effects	F(5, 2138) = 1.20 [0.3053]	F(5, 2154) = 0.49 [0.7825]	F(5, 2145) = 0.78 [0.5666]

***Notes*:** *p*-values are in brackets. ***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

sale of a debt-stricken Korean conglomerate, the Daewoo Group, faced difficulties, also contributed to the fall in stock prices.

We estimated the effects of this event on South Korean financial markets using the same method described above. The results are summarized in Table 12. South Korean financial markets were significantly affected. The impact of this event was felt strongly in the stock market, which was negatively affected for all 5 days during the event window and for 3 days the impact was significant. Furthermore, the joint significance tests suggest that this event exerted influence on all three South Korean financial markets. These results stand in contrast to North Korea-related events, most of which affected only one of the three markets. The impacts of this event are more substantial than those of North Korean events in terms not only of the numbers of affected financial markets but also in terms of magnitude. Comparing the results of Table 12 (a drop in the price of a semi-conductor chip and the difficulty in selling Daewoo) with Tables related to North Korean events suggests that the magnitude of the former effects is multiple times larger than those of all North Korean events in all financial markets with the sole exception of the effect of the North Korean nuclear test on South Korean foreign exchange markets.

Table 12. Effects of South Korean events on South Korean financial markets: Decrease in semi-conductor chip price and difficulty in selling Daewoo (18 September 2000)

	Stock market return (KOSPI Index)	Exchange rate (% change against USD)	Change in yield spread between USA and S. Korea (treasury bill)
CAR_{t-2}	−3.138 (1.83)*	0.449 (1.00)	0.160 (3.03)***
CAR_{t-1}	−3.167 (1.31)	0.482 (0.76)	0.159 (2.14)**
CAR_t	−11.05 (3.73)***	2.281 (2.95)***	0.310 (3.39)***
CAR_{t+1}	−12.16 (3.55)***	1.304 (1.46)	0.260 (2.46)***
CAR_{t+2}	−5.90 (1.54)	1.234 (1.23)	0.209 (1.77)*
Joint significance test	7.70 (0.000)***	4.41 (0.001)***	3.82 (0.002)***

***Notes*:** Absolute *t*-values are in parentheses. ***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

5. Robustness checks

In this section, we present some robustness checks. Instead of looking at the particular events we selected, we regressed financial market variables on the changes in the Korea Peace Index (KOPI), an index compiled by the Asia-Pacific Research Center at Hanyang University in South Korea to gauge the state of tension on the Korean

peninsula. The method for compiling the KOPI is the same as that for the Conflict and Peace Database (COPDAP) 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 for each event is aggregated according to a pre-determined scale. The index ranges between −105 and 92, representing, respectively, complete warfare and voluntary unification.

We took the percentage change in the daily index of KOPI between June 2000 and June 2008 as the independent variable. We used the same controls as in Table 3 for the equation of stock market return, and added the Dow Jones Index with two lags and two leads for the equations for the exchange rate and the change in the 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 13 shows the estimation results. There is 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 could be raised about possible instability of parameters of returns obtained by event studies in the presence of structural breaks (Burnett *et al.*, 1995).[12] In the presence of structural breaks, the results from an event study analysis might indeed 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.

The 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) that 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, the method is designed to pinpoint significant changes in the mean level of a series. We ran a programme to detect structural breaks for the KOSPI Index return, the change in the exchange rate between the South Korean Won and the US Dollar and the change in the yield spread between Korean and US 3-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 Bai and Perron (1998, 2003).[14]

The second method uses our prior information about potential structural breaks. The South Korean government led by Kim Daejung developed the so-called

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

[13] Another possible cause of concern might be the presence of unit roots in the time series. The presence of unit roots may cause our regressions to be spurious. We found that the three series present little suggestive evidence of unit roots in our series. To check the existence of unit roots more formally, we applied the augmented Dickey–Fuller tests for the three dependent variables and found that all three variables are stationary.

Table 13. Robustness check using KOPI

	Stock market return	Exchange rate (% change against USD)	Change in yield spread between USA and South 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)

Notes: Absolute *t*-values are in parentheses. ***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

'Sunshine Policy' of appeasement towards North Korea. Kim Daejung 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 been the policy until then. The following president, Roh Moohyun, also adhered to this policy. However, the following president, Lee Myungbak, who started his term in February 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 first summit of the two Korean leaders in June 2000 until the starting date of the Lee Myungbak presidency, on 25th February 2008, and the second period from 25th February 2008 onwards. We coded a 'sunshine' dummy for the first period and a 'new policy' dummy, respectively. As one can see from Table 14, none of the dummy variables is significant except for the exchange rate in the second period. This probably, however mainly reflects the depreciation of the Korean currency due to the subprime mortgage crisis that coincided with Lee Myungbak coming to power. We also tested the possibility of a break in slopes by using an interaction term between policy dummies and the US stock return, and found such terms not to be significant.

Table 14. Tests of structural breaks due to the introduction of the sunshine policy and its abandonment during the Lee presidency

	Stock market return	Exchange rate (% change against USD)	Change in yield spread between USA and S. Korea (treasury bill)
Sunshine dummy	0.169	−0.005	0.005
	(0.37)	(0.11)	(0.95)
New policy dummy	0.094	0.162	−0.006
	(0.37)	(2.55)**	(0.75)

***Notes*:** Absolute *t*-values are in parentheses. ***Significant at 1% level. **Significant at 5% level. *Significant at 10% level.

We conclude that there are no structural breaks related to North Korean events or to changes in South Korean government policy.

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 affected South Korean financial markets. The striking result is that there are mainly no effects. The strongest positive 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 than a reduction in the North Korean threat. The strongest negative effects are related to the North Korean nuclear test-related events in October 2006. However, these affected only the foreign currency markets. 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 more and more dependent on foreign assistance (Kim *et al.*, 2007; Noland and Haggard, 2007). The regime would likely not be able to sustain any kind of military adventure. Moreover, the North Korean leaders are not suicidal and know that if they ever drop a nuclear bomb on South Korea, this would mean assured self-destruction. This is particularly true

considering the alliance between the USA and South Korea. Financial markets do not respond to North Korean threats because they believe that the North will ultimately not choose a military action because of the credibility of the deterrent maintained by the USA–South Korea alliance. Hence, the interest of the North Korean leaders is to appear threatening to extract financial aid from the international community. This allows them to buy time before the launch of a serious economic reform or the final collapse of the regime. The death of Kim Jong-Il and his replacement by his son Kim Jong-Un may accelerate changes.

These results give quite clear policy conclusions. The Korean financial markets view that one should not fear the North Korean regime and its threat. Haste in the attempt to persuade North Korean authorities to stop further missile or rocket launches 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 keeping the dialogue open could help the North Korean leaders realize that their threats do not work.

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