Impact of North Korean Threats on Housing Prices in South Korea: A Research Note

Craig S. Galbraith*
Duke Progress Energy/Betty Cameron Distinguished Professor, Cameron School of Business, University of North Carolina Wilmington, 601 S. College Road, Wilmington, NC USA
galbraithc@uncw.edu; (910) 962-3775 (office)

Edward Graham
Professor, Cameron School of Business, University of North Carolina Wilmington, 601 S. College Road, Wilmington, NC USA
edgraham@uncw.edu; (910) 962-3516 (office)

Jake Lee
Graduate Student, Cameron School of Business, University of North Carolina Wilmington, 601 S. College Road, Wilmington, NC USA
csbgrad@uncw.edu; (910) 962-2157 (office)

Prior studies have uncovered a variety of exogenous events or activities that can impact the housing prices in a region. For more than seventy years, tensions between North Korea and South Korea have run high, and are sometimes violent. This study examines the impact that different threats have on housing prices in South Korea. Using three different measures of threats by North Korea, we examine housing prices in thirteen different city regions in South Korea. The results indicate a significant impact for three of the regions, regions that have a large United States military presence or are very close to the demilitarized zone. However, the study does not find a significant impact for the country of South Korea in general, or most of the regions studied.

Keywords

Housing prices, Threats, Korean peninsula

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*Corresponding Author

1.   Introduction

To what extent do external threats affect the decision-making of investors? It has long been recognized that various external or exogenous events can impact financial markets, such as stock prices, interest rates and housing prices, in different ways. The present study examines the impact of various threats by North Korea on the residential housing prices in South Korea. Due to the nature of the Korean Peninsula, the government of North Korea regularly initiates a variety of militaristic threats, such as nuclear weapons testing, ballistic and short-range missile firings, troop movements, infiltrations, and various bellicose sounding public announcements. This study examines the impact that the threats of North Korea have upon property prices in South Korea, especially in the border areas.

2.   Literature Review

Understanding how external or exogenous shocks impact both global and regional financial markets has been of interest for decades. One important class of possible external shocks are violent acts and perceived belligerent threats. These actions can take many forms, such as direct threats of military interventions, low intensity sponsored military incursions, arms testing, aggressive posturing, acts of sabotage, riots, and terrorism. Not surprisingly, there is a growing literature that examines violent acts, or perceived threats, on different components of the financial markets. Many empirical studies have focused on the direct impact of specific violent acts, such as terrorism on global financial markets. A number of empirical studies have found, for example, that global financial markets are generally resilient to terrorist acts, although certain sectors, such as insurance and airlines, tend to be more negatively impacted than other sectors (e.g., Chen and Siems (2004); Chesney et al. (2011); Markoulis and Katsikides (2020)). Some studies have also suggested that the financial markets in less developed economies appear more impacted by terrorist acts than in developed economies (Asaad and Marane, 2020; Ahmad et al., 2022). Region or country-specific studies outside the United States (U.S.) and Europe are somewhat rarer (see Lee and Lee (2021); Huh and Pyun (2018); and Asaad and Marane (2020) for discussion).

With respect to the Korean Peninsula, one interesting line of event-related risk research has examined the impact of North Korean nuclear tests on financial markets. Baek (2021), for example, examines the impact of North Korea nuclear tests on various Asian stock markets. He finds that the Chinese stock market tends to be more sensitive than the markets in other Asian countries, with Japan being the least impacted. In all of the markets, however, the impact is short-term. Using a similar event approach, both Lim (2012) and Huh and Pyun (2018) also find that nuclear tests by North Korea only have a short-term impact on the South Korean stock markets. While nuclear tests represent a

specific type of event, other types of threatening behaviors may also impact financial markets. Kim (2014) and Dibooglu and Cevik (2016), for example, use a broader definition of threats, including various announcements and bellicose statements by North Korea, such as that identified in the North Korean Threat Index (NKTI). In general, these studies also find little impact on the South Korean financial markets. Son and Moon (2021) suggest the reason for this might be that over time, the South Korean population and institutions have learned to disregard these actions because they consider them to be more propaganda devices than real threats to the country due to the almost continuous barrage of threats from the government of North Korea.

The above studies, however, have generally examined the broader financial markets, such as the stock markets, whereas our focus is on the real estate market. There has been far less published research on the impact of exogenous related threats to real estate markets, and little published regarding the impact of North Korean threats on South Korean real estate markets. It is certainly recognized that there are different types of threats or negative events, not all military in nature, that can impact real estate markets. Tanaka and Zabel (2018), for example, examine the impact of the Fukushima Daiichi nuclear reactor accident in 2011 on housing prices near nuclear power plants within the U.S., and find that the negative impact increases with proximity to a nuclear power plant. Episodic periods of pollution have also been found to impact property values (e.g., Xue et al. (2022)). Earthquakes, and other natural disasters also present an important event risk. A number of researchers (e.g., Murdoch et al. (1993); Önder et al. (2004); Cheung et al. (2018)) have investigated the negative impact of earthquakes on housing prices. Similarly, Murphy and Strobl (2009) and Below et al. (2017) examine the negative impact of hurricane events on housing prices in various U.S. coastal regions. In general, while these types of natural events appear to negatively impact property prices, the impacts tend to be relatively minor and temporary in nature. With respect to more militaristic or violent acts, there are even fewer published studies. Elster et al. (2017) find that rocket attacks in Israel lead to a 6% to 7% decline in housing prices and rents near impact points. Besley and Mueller (2012) find a similar negative correlation between violence and housing prices in Northern Ireland while Collins and Margo (2007) find a negative correlation between riot severity, with the greatest impact occurring in central-city property values near the riot flashpoints. Studies have also indicated that the demand for property insurance does increase with terrorist acts, with prices being relatively inelastic (Michel-Kerjan et al., 2014).

Since the Korean War, the border between South Korea and North Korea has been one of extreme tension. Hostilities between the two countries, and their allies, broke out on June 25, 1950, and officially ended on July 27, 1953. The ending of the war, however, was based on a signed armistice which represents a ceasefire of military actions, rather than a typical agreement to normalize relations. This armistice established a 4,000-meter-wide zone called the demilitarized zone (DMZ) as a buffer between the forces. In addition, the

military forces of both countries are often on high alert and stationed near the DMZ. The U.S. military has had a strong presence in South Korea, and there are several military bases scattered throughout South Korea, particularly in the border areas. North Korea, under the Kim family dynasty, is well known for its bellicose rhetoric toward South Korea and the U.S., as well as its interest in developing nuclear weapons, and their delivery systems. While in the past there have been various meetings and summits designed to lower friction between the two countries, such as the June 2000 and October 2007 inter-Korean summit meetings and the 2018-2019 Korean Peace Process, the implied threats from North Korea to South Korea have generally continued unabated. These include nuclear tests, military maneuvers and actual live fire skirmishes, infiltrations, ballistic and short-range missile launches, and artillery firing.   In addition, various high-ranking officials including the supreme leaders of North Korea: Kim Il Sung, Kim Jong Il, and currently Kim Jong Un, regularly make inflammatory and threatening statements directed toward South Korea and its allies, such as the U.S.

3.   Study

This leads to our two research questions.

Research Question 1: Do increases in North Korean threats negatively impact the housing property prices in South Korea?

Research Question 2: Are housing property prices in cities/regions near the border of North Korea more impacted?

Dependent Variable: Housing price data were collected from the KB (Kookmin) Bank in South Korea. The KB Bank has the longest and most detailed dataset, across a number of different communities in South Korea. This allows for an examination of distance from the border. Another source of housing price information is provided by government agencies, such as the Ministry of Land, Infrastructure, and Transport (MOLIT), but these government agencies also use data from the KB Bank. The time period examined in our study is from February 1986 to June 2022 (N=437); however, some of the cities have only reported housing prices starting from September 2003 (N=226).

By late 2021, the South Korean housing market was experiencing extremely high inflation rates, which became a major political issue in the March 2022 presidential election. In August 2022, the South Korean government announced a large program to provide 2.7 million homes over the next five years as well as various changes to the national real estate tax and administrative rules. We therefore stopped our analysis in mid-year of 2022 prior to the impact of these recent aggressive government actions.

We examined several different regions in our study - South Korea in general, the six largest cities combined, and thirteen specific cities/regions (Seoul, Busan, Daegu, Incheon, Gwangju, Daejeon, Ulan, Uijeongbu, Paju, Gimpo, Gangwon-do, Chuncheon, and Wonju). Several of these city regions have a significant number of military bases with the Paju and Uijeongbu communities reporting the highest number of U.S. military installations. Since one of our research questions addresses the impact of distance, we use a distance measure (linear miles) obtained from Google Maps from the closest border between North Korea and South Korea to the center of the examined district.

North Korean Provocation and Nuclear Threat Data: Data were obtained from the Center for Strategic and International Studies (CSIS). The CSIS has compiled a database of all North Korean provocations since the Korean War in 1953, beginning with the first provocation documented in 1958. This dataset identifies the nature of the provocation. For our analysis, we defined two variables: a dummy variable that represents whether any major provocation (except nuclear) occurred during that month, NK(Provocation), and another dummy variable if the provocation involves a nuclear test or event, NK(Nuke). The CSIS data used in our analysis goes back to February 1986.

North Korean Threat Variable: The North Korea Threat Index (NKTI) data was used to measure our NK(Threat) variable. The data are obtained from NK News.org. The NKTI is a real-time updated data stream that portrays the current level of aggression reported in the North Korean media. Each day, the KCNA Watch website scans the day's latest English language articles and totals the number of aggressive words within the reporting. This figure is then divided by the number of articles published that day to provide a value, thus resulting in a continuous score variable. The list of aggressive words includes terms regularly used by North Korean journalists or editorial writers during times of heightened tensions. The NKTI in our study is for the time period of September 2016 to June 2022.

Control Variables. We used two control variables: government (dummy variable, liberal versus conservative party in South Korea) and South Korean mortgage interest rates. We used the government variable as a control variable since it is often argued that conservative governments in general are generally associated with higher housing prices than liberal governments (see Ansell (2014) for a discussion of these arguments). In addition, it might be argued that some South Korean liberal governments worked closer with the North Korean government than South Korean conservative governments on economic and human aid, thus possibly reducing antagonistic behaviors.[1]

[1] We also considered the issue of formal peace talks as a variable. Significant peace summits between South Korea and North Korea were held in 2000, 2007 and during the Korean Peace process in 2018-2019 which involved then President Donald Trump. Using the NKTI data set, we created dummy variables for the 2018-2019 peace summit periods. Examining the monthly variable (NKThreat), there was, indeed, a somewhat

Method: There are a number of methods typically used for analyzing the impacts of events on multiple time series, such as housing prices. The most common are generalized autoregressive conditional heteroskedasticity (GARCH) models and transfer function autoregressive integrated moving average (ARIMA) models, although various neural network models have also been employed. Due to the exploratory nature of our research, and the generally unknown nature of potential lagged effects, we selected a transfer function ARIMA model for our study. This method has been used in a number of recent housing price studies (e.g., Abuanzeh (2023); Zhao et al. (2019); and Zhao et al. (2020)), and is often recommended for construction data with potential lagged relationships (e.g., Ashuri et al. (2012)). Transfer function ARIMA is designed to relate the time series of independent (predictor) variables to values of the dependent series. The process of estimating a transfer function is first, model identification and then, second parameter estimation. The first step involves identifying the appropriate ARIMA model in the dependent variable (in our case, housing prices). This is normally done by investigating the associated autocorrelation function (ACF) and the partial autocorrelation function (PACF) in order to obtain the appropriate ARIMA model for the dependent variable. We used the SPSS forecasting package, version 29. One option in the SPSS forecasting package is an artificial intelligence sub-program that provides an estimate of the appropriate ARIMA model (Time Series Modeler procedure). The second step of the transfer function is to find the correlation and model estimates between the independent predictor variables and the transformed dependent variables. Non-stationarity was investigated by using the augmented Dickey-Fuller unit root test. Not surprisingly, similar to most housing price data, the residential housing data in the South Korean markets was also non-stationary. Stationarity was achieved by differencing the monthly housing price data.

Results: In almost all the regions, the models were effectively estimated as ARIMA (2,1,1) based on the examination of autocorrelations, etc. There were a few regions, however, that showed slightly different model structures, but for comparison purposes we used ARIMA (2,1,1) as the base model for all of the regions. However, we also used the SPSS AI-based modeler program for each region. In almost every case, however, the ARIMA (2,1,1) model resulted in more statistically significant models with better goodness of fit statistics than models estimated from the SPSS modeler procedure. It is interesting to note that while the NKTI has only six years of monthly data versus the longer CSIS data, the same ARIMA (2,1,1) model specification is generally the same between the two data sets. For the NKTI data, we "lagged" the NK(Threat) data to obtain the best fitting model. The analysis that used the full CSIS data did not include the NK(Threat) variable.

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lower threat index during these peace processes; however, the difference was not statistically significant.

The results of our estimated models were only partially significant. While statistically significance was generally obtained on the interest rate control variable, and the estimated coefficients for the three threat variables were generally in the expected (negative) direction, only three of our city/region models produced statistically significant coefficients on a threat variable. Table 1 shows the results for the three statistically significant models related to threats: City of Uijeongbu (north of Seoul), City of Paju (near Panmunjeom on the 38th parallel), and City of Gimpo. We also include the estimated model for all of South Korea. As previously mentioned, both Uijeongbu and Paju are known for having a significant military presence, while Gimpo, which borders Incheon, is the community that is closest (<3 miles) to the North Korea border in our study. The statistically significant results for these three communities may indicate a negative threat impact on residential housing prices for the communities with a large number of U.S. military installations, or under a direct threat from short-range military action (infiltration, small arms fire) versus other communities in our study.

The second research question addresses the issue of whether distance from the border has an impact. While the majority of the models did not produce significant estimated coefficients on a threat variable, we still examined this issue for discussion purposes. We divided the distance to the border into three categories: near (<30 miles), middle (30 to 100 miles), and far (over 100 miles); see Table 2. We then simply averaged the NK threat coefficient for the models (Model 1). While not statistically significant, it is interesting to report the results which indicate that there might be a distance effect. Similar results were found for the other threat coefficients.

Table 1   Transfer Function ARIMA Model: Significant Threats

	Paju ARIMA (2,1,1)		Uijeongbu ARIMA (2,1,1)		Gimpo ARIMA (2,1,1)		South Korea ARIMA (2,1,1)	
	ARIMA NKTI	ARIMA CSIS	ARIMA NKTI	ARIMA CSIS	ARIMA NKTI	ARIMA CSIS	ARIMA NKTI	ARIMA CSIS
Constant	0.974**	-0.085	0.655	0.172	1.939**	-0.038	-0.462***	0.229**
NK Threat (lag 1)	-1.108**		-0.235		-1.709***		-0.023	
NK Provocation	0.033	0.020	-0.075	-0.096***	-0.141	-0.008	0.037	-0.031
NK Nuclear	0.040	-0.107	0.171	0.018	0.200	-0.222	0.149	-0.087
Interest Rates	-0.659*	0.002	-0.305	0.026	-2.057**	-0.038	-0.160*	-0.022
Government	-0.176	0.370**	-0.118	0.002	-0.262	0.229	-0.079	0.023
Stationary R^2	0.618	0.439	0.808	0.716	0.448	0.427	0.821	0.613
N	69	226	69	226	69	226	69	437

Notes: ***prob<0.10; **prob<0.05; and *prob<0.10 (One-tailed)

Table 2   Impact by Distance to North Korea Border

Proximity of City/Region	Average Coefficient on NK Threat	Median Coefficient on NK Threat
Near (<30 miles)	-0.701	-0.672
Middle (30 to 100 miles)	-0.278	-0.303
Far (>100 miles)	-0.195	-0.130

4.   Discussion

This is one of the few studies that examines the impact of militaristic posturing and threats on housing prices over time. Using housing price data from South Korea and different measures of threats and provocation from North Korea, our model shows at best, a marginal impact. Of the thirteen community models examined, only three models produce a statistically significant coefficient on a threat variable. Two of these models, however, are from communities with a large U.S. military presence, while the third statistically significant threat model is from the community closest to the border. Even in the non-significant models, the threat variables are generally still in the hypothesized direction. The results, while not highly significant, are still intriguing. There are many regions under threats of violence and war. As of mid-2024, for example, the Global Conflict Tracker from the Council on Foreign Relations (CFR) identifies approximately thirty ongoing situations in the world that involve significant violence. This includes not only the on-going war between Ukraine and Russia, but also possible cross-border tensions between Taiwan-China, Kosovo-Serbia, India-Pakistan, and the continuing conflicts that surround the State of Israel. In addition, there are internal conflicts in many nations that result in regular violent activities. One of the major areas of concern identified by the CFR is the continuing North Korean development of nuclear weapons and ballistic missile testing. All of these have the potential of impacting financial markets, including real estate and housing markets. Clearly, more research is needed to examine this important connection.

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