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國際學碩士學位論文

**Bilateral Reciprocity in US-ROK-DPRK Relations
during the Second Nuclear Crisis:
A Time Series Analysis using Vector Autoregression**

2차 북핵위기에 나타난 양자주의적 상호성의 연구:
벡터자기회귀모형을 통한 시계열적 분석

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國際學科 國際協力專攻

沈 揆 姬

**Bilateral Reciprocity in US-ROK-DPRK Relations
during the Second Nuclear Crisis:
A Time Series Analysis using Vector Autoregression**

A thesis presented

By

Kyuhee Shim

to

Graduate Program in International Cooperation
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Seoul National University

Seoul, Korea

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Abstract

For a time that has now long surpassed more than a decade, the international community has been able to witness the stark inability of the international community to deal effectively with the North Korean nuclear crisis, with growing alarm, which has led to vigorous and ongoing debates on North Korea policy.

In these discussions, where arguments can be typically categorized into those that are supportive of engagement and those are more skeptical, a subject matter that has garnered much interest and speculation amongst its participants, and regardless of their respective views, has been the North Korea's regime's capacity to reciprocate.

Because the North Korean response is the most critical factor in determining the success or failure of any given policy, being able to predict whether or not North Korea will respond favorably when treated with a cooperative gesture is useful, to say the least, in constructing an effective strategy.

This study has converted the past decade-worth of media reports into statistical data upon which a quantitative experiment was conducted in order to examine the interactions that have occurred between North Korea, the United States, and South Korea for the period of 2001-2010.

With the aim of discerning whether North Korea has so far presented itself to be an engageable partner, a statistical model was specifically designed to detect patterns of strategic response—namely reciprocity, but also inverse response, policy inertia, and triangularity.

Through this experiment, it has been discovered that North Korea reciprocated

sustainedly in its relationship with the United States; and also towards South Korea during the latter half of the period. In no instance was North Korea found to have exhibited a pattern of inverse response. In other words it never responded to cooperative gestures with aggression.

Also, and contrary to what has often been claimed, there was no evidence of a North Korean scheme to create divisions within the US-ROK alliance. Rather when North Korea received cooperative gestures from one partner it increased its level of cooperation towards the other in response.

Overall the results reveal that the past decade was a major missed opportunity. North Korea's past behavior clearly indicates a willingness to enter into a more cooperative relationship with the two countries that are often regarded to be in a hostile relationship with the regime. Overall the results suggest that the entire crisis situation might have fared better if engagement had been pursued more aggressively.

Keywords: North Korean nuclear crisis; inter-Korean relations; vector autoregression; behavioral patterns; bilateral response; triangularity; reciprocity; inverse response; policy inertia

Student Number: 2011-22375

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1. Introduction

1.1 Background

The latest North Korean nuclear crisis to have hit the Korean peninsula began with the revelation that the North Korean regime had begun renewing efforts to realizing its long-held ambition of becoming a nuclear power. This revelation was earned in October 2002 when US envoy James Kelly was on a special visit to Pyongyang to confront the regime on recent suspicions regarding the status of its nuclear activities. Allegedly it was during this meeting that North Korean delegates first admitted the existence of a nuclear weapons program based on highly enriched uranium.

After this admission had been made public the regime was internationally denounced for committing grave violations of its treaty obligations, including the Agreed Framework which had been instrumental in ending the first nuclear crisis in 1994. The United States along with other contributing nations to KEDO, declared the indefinite suspension of heavy-fuel oil deliveries as its first action of response.

North Korea, however, did not relent and instead moved to reactivate its nuclear facilities that had been previously frozen by the end of the year it had disabled all IAEA monitoring equipment from its facilities and removed all IAEA inspectors. In 2003, North Korea became the first country to withdraw from the Non-Proliferation of Nuclear Weapons Treaty (NPT), a treaty that bans its signatories from the manufacturing of nuclear weapons. The regime also began to regularly express its growing intention to opt out of the moratorium on long-range missile testing. It went on to conduct a test-fire of a long range missile and its first nuclear test in 2006.

The negotiation process aimed at resolving the crisis by means of a peaceful settlement began on August, 2003. They were first proposed by the Chinese government in order to provide alternative setting for dialogue to take place after the US showed a reluctance to engage in direct talks with the regime. As a multilateral forum, the six party talks is comprised of the six leading stakeholders in the region—North Korea, the United States, China, South Korea, Japan, and Russia—and has since been held for a total of six rounds.

However the six party talks have lacked any substantial progress. Partly this was due to the irreconcilable stances of North Korea and the United States on the order of action and rewards. North Korea demanded a security guarantee and normalized relations with the United States before the possibility of its disarmament be discussed. The United States, however, wanted the regime to first commit to the complete, verifiable, and irreversible dismantlement pertaining to all of its nuclear facilities and repeatedly shot down North Korea's requests for early concessions.

During the fourth round parties were finally able to reach a modest breakthrough in the form of a joint statement in which North Korea committed to abolishing its nuclear program and to come back into compliance with IAEA safeguards. In return parties agree to work towards normalizing relations with the regime. The United States also gave its assurances that it will not invade North Korea's territory. The agreement, however, fell apart when North Korea failed to implement its promise.

As of 2009 the talks have moreover become indefinitely stalled due to North Korea's decision to boycott the process in a reaction to a United Nations Security Council (UNSC) Presidential Statement that condemned its satellite launch and prescribed further sanctions against the regime. Then on February 2013, North

Korea went a step further into aggravating its neighbors and conducted its third underground nuclear test. This test was soon to be followed by North Korea's declaration that it would unilaterally end the war armistice along a lengthy warning in which North Korea promised "merciless" military retaliation to its perceived enemies.

1.2 Statement of the problem

Owing to its growing level of threat as well as urgency, there is quite obviously a pressing need for a new and lasting breakthrough in the crisis.

Strategy-wise, however, countries are faced with a limited set of options. This is because, and although the North Korean nuclear crisis deserves nothing short of proactive intervention, already a preemptive military strike has been largely overruled largely because regional leaders fear that they would be viewed as prime targets in the instance of a retaliatory attack. Judging from the strong resilience of the North Korean regime that the world has been able to witness throughout its modern history, a mere waiting game against the regime is also likely end in vain and only allow for the crisis to develop beyond its current manageable levels. Thus despite so far having only had a questionable degree of success, choosing amongst a strategy of continued engagement and/or containment remains to be the only available and realistic choice to be made.

For the purposes of this study, I define engagement and containment as policies which utilize different tools through which they attempt to induce cooperation. In order to solve instances of inter-state conflict. Specifically engagement would be a policy whereby national leaders would utilize cooperative initiatives whereas containment would be a policy that utilizes hostile incentives.

And as their names would imply, cooperative initiatives induce cooperative behavior by way of suasion, whereas hostile initiatives are based on coercion. If a country were to utilize a carrot strategy it could take the form of monetary payments, offers to normalize once-severed relations, or security assurances which would be offered in exchange for some form of measure of compliance on behalf of the receiving party. A negative inducement would then comprise of tactics that involve verbal and physical forms of pressure, such as would be economic and trade sanctions or a condemning statement.

Though they differ in their methods positive and negative inducements, however, seek to attain a common end. And that common end is to modify the undesirable aspects of another country's behavior towards to whoever whom they are directed so as to resolve a confrontational situation, much like how the six party nations are attempting to achieve with the North Korean regime.

What is important, however, is that in order to have their intended effects these tools must be used discriminately. Due to their operating nature, positive and negative inducements are better suited for circumstances that are specific and distinct. Positive inducements would work best when the targeted country has a tendency to reciprocate while negative inducements when a country chooses to behave in a manner that would be the direct opposite of what would commonly be considered to be a reciprocal response, also known as an inverse response.¹ Inverse response is a term that has been coined by Joshua Goldstein in this book the Three-way Street where he also happens to label those countries that possess a tendency

¹ Joshua S. Goldstein, and John R. Freeman, *Three-Way Street: Strategic Reciprocity in World Politics*, (Chicago: The University of Chicago Press, 1990).

towards exhibiting patterns of inverse response as a 'bully.'²

This is a connection that is rather intuitive. Logically no country would be willing to offer monetary or political concessions only to have them not only gone unpaid for but also to inversely trigger an action amounting to a hostile response due to its kindness being perceived as a sign of weakness, or be willing to apply punitive sanctions if they serve no other purpose other than to only anger and arouse the belligerence projected by the other side. Hence, concessions are typically made under the expectation that they would be repaid in kind, and sanctions under the expectation that they would earn the submission of an otherwise unyielding party.

The problem is that North Korea is like a black box when it comes to the decisions made by its veiled and secretive regime. What comes out of it we know of by way of its actions, but what goes on inside of it, such as its decision-making processes and its motives in regards to its nuclear program, are virtually unknown. This means that how North Korea ultimately came to the conclusion that it needed to build nukes can only be put to speculation. North Korea's nuclear ambitions may have been borne out of purely malicious intent, a need to enhance its leverage so as to more easily win over aid concessions, or as a last resort in response to an ever-more hostile environment that threatens its existence. Whatever the reason may be, the problem that remains is that unknowing of North Korea's end-game in its nuclear affairs ultimately forbids us any hints or direction as to how it ought to be dealt with. In other words, countries are less able to definitively discern the correct tools through which cooperative behavior can be induced more effectively because they are less capable of being able to predict its manner response to these tools.

² Ibid.

1.3 Study aim

As a way of circumventing this stated problem, I have chosen to analyze North Korea's outward behaviors through the applied usage of a statistical model in order to decide whether or not the conditions for engagement have been present in the case of the North Korea regime during the first decade of the crisis. Because though granted statistics cannot tell us whether or not North Korea will eventually give up the bomb, they can be able tell us whether North Korea's response has so far been more favorable towards efforts to engage or efforts to coerce. Hence although this research will not deal with these policy tools directly, its conclusions will provide insights that may serve to strengthen our assumptions upon which better policy decisions can be made.

The main assumption that this study seeks to develop is whether or not North Korea has acted in a way that it can be considered as somewhat of an engageable partner whether it actually is a bully. In this study this question will be asked, and sought to be answered, by conducting what has been called a 'quasi-experiment' which utilizes the primary method of vector auto regression analyses (VAR). To test A VAR model will be fitted with statistical data that has quantified the interactions that have occurred in 2001-2010, and produce estimates upon which I will be able to observe not only patterns of reciprocity and inverse response but also patterns of policy inertia and triangular responses. As it has been mentioned, patterns of reciprocity, if they might appear, I will regard as a positive indicator for engagement while patterns of inverse response would indicate that a policy of engagement would only prove to be futile and self defeating to its purpose. Policy inertia and triangular responses I then additionally examine, not only because their inclusion would complete the entire range of possible response patterns, but also because their analyses would add much to the scope of insight. If they be explained

briefly, policy inertia will serve as a measure of how much a state's behavior is being governed by its past choices as opposed to external factors while triangular responses will reveal how response patterns have spread. Much like bilateral responses, triangular patterns can also appear to be reciprocal, inverse, or of inertia, and depending on its type.

1.4 Structure

The remainder of this study has been structured in the following manner:

Chapter one will end with a literature review which will seek to summarize the major points within the arguments that have been made in relation to the ongoing North Korea policy debate. A subsection in literature review will then review the conclusions that have been earned by other similar studies that have been performed previously. The purpose of this review will be to illustrate the wide gap in the qualitative assessment of the past decade and of North Korea in general. In chapter two I introduce the four types of behavioral response patterns along with a summary of their theoretical backgrounds as well as their policy implications which will later factor into my analyses. Chapter two will also contain a description on Richardson's mathematical model and Richardson's assertions regarding state behavior. This framework will later be incorporated into my VAR model. Chapter three will state this study's research question and four hypotheses that will be tested. In chapter four I will detail how the quasi-experiment was designed and conducted, such as how a time series was constructed, how a VAR model was designed, specified, and subjected to additional tests for data analysis and model specification. In chapter five I will analyze the VAR estimates which have been divided into two sub-periods. Chapter six will contain my overall conclusion in regards to the hypotheses as well as an assessment of the first decade of the nuclear

crisis.

1.5 Literature Review

1.5.1 Review of the debate

The North Korean policy debate has become truly invigorated with the eruption of the second crisis and its subsequent protraction. In this literature review academic opinions will be dealt in two subsections depending on whether they have argued in favor of a policy engagement or a policy of containment which happen to be the two policy options that have received the most attention in this ongoing debate, mostly due to the lack of any other plausible alternatives. And in reviewing the variety of opinions that exist in this debate, this literature review will attempt to illustrate the wide gap in perceptions and expectations that are held towards the North Korea regime regarding its fundamental nature, its behavioral tendencies, and underlying motives in regards to its nuclear program and the nuclear crisis.

1.5.1.1 Arguments in favor of engagement

Pro-engagement arguments typically begin with the leading premise that North Korea's motives for nuclear development stems from its perceived security dilemma.³ Under this perspective, North Korea is believed to have been compelled

³ Victor D. Cha, and David C. Kang, *Nuclear North Korea: A Debate on Engagement Strategies*, (New York: Columbia University Press, 2003)., Leon V. Sigal, *Disarming Strangers: Nuclear Diplomacy with North Korea*, (Princeton University Press: Princeton, 1998)., Lee, Jung-Hoon, and Chung-In Moon. "The North Korean Nuclear Crisis Revisited: The Case for a Negotiated Settlement." *Security Dialogue*. no. 2 (2003): 135-151., Chadwick I. Smith, "North Korea: The Case for Strategic Entanglement," *Orbis*, 50, no. 2 (SPRING 2006): 343-353., Randall E. Newnham, "'Nukes for Sale Cheap?' Purchasing Peace with North Korea," *International Studies Perspective*, 5, no. 2 (2004): 164-178.

into developing a nuclear deterrent due its international isolation and also due to an anticipated military invasion by the United States attempting to topple the regime.⁴ Similarly, the regime's perceivably belligerent outward behavior has also been viewed the result and expression of North Korea deep and underlying insecurities.⁵ Thus, based on this perspective, the regime must be first provided with enough assurances to be able to convince it into believing that its existence is not in peril, which can only be done through a policy of engagement.⁶

Then others have expressed their support for engagement policies simply because they view it to be a better option when compared with a policy of containment. For instance, Sigal argues that contrary to what has been argued by the hardliners, punitive measures have never been much successful.⁷ Others have then further elaborated on how punitive measures that are intended to coerce North Korea's compliance have only had the opposite effect of eliciting more aggressive

⁴ Victor D. Cha, and David C. Kang, *Nuclear North Korea: A Debate on Engagement Strategies*, (New York: Columbia University Press, 2003)., Chadwick I. Smith, "North Korea: The Case for Strategic Entanglement," *Orbis*, 50, no. 2 (SPRING 2006): 343-353.

⁵ Victor D. Cha, and David C. Kang, *Nuclear North Korea: A Debate on Engagement Strategies*, (New York: Columbia University Press, 2003).

⁶ Leon V. Sigal, *Disarming Strangers: Nuclear Diplomacy with North Korea*, (Princeton University Press: Princeton, 1998)., Lee, Jung-Hoon, and Chung-In Moon. "The North Korean Nuclear Crisis Revisited: The Case for a Negotiated Settlement." *Security Dialogue*. no. 2 (2003): 135-151, 136., Andrei Lankov, "Staying Alive: Why North Korea will not Change," *Foreign Affairs*, 87, no. 2 (MAR-APR.,2998): 9-16., Andrew Mack, "The Nuclear Crisis on the Korean Peninsula," *Asian Survey*, 33, no. 4 (APR 1993): 339-359.

⁷ Leon V. Sigal, *Disarming Strangers: Nuclear Diplomacy with North Korea*, (Princeton University Press: Princeton, 1998),

behavior.⁸

Smith then argues that North Korea deserves to be engaged because in the past it has tended to behave reciprocally.⁹ He however cautions that North Korea will be reluctant to make the first move and that other countries should attempt at engaging it first.¹⁰ Clemens further supports this by saying that when there is an apparent power asymmetry between two countries that are mired in a conflict that it is actually easier for the stronger party to make the first move.¹¹

Still others have supported an engagement policy because they perceive North Korea to be a willing participant. Namely, Oh observes that North Korea is not

⁸ Kongdan Oh, and Ralph C. Hassig, "Guessing Right and Guessing Wrong about Engagement," *The Journal of East Asian Affairs*, 15, no. 1 (SPRING/SUMMER 2001): 15-41., Leon V. Sigal, "North Korea is no Iraq: Pyongyang's Negotiating Strategy," *Arms Control Today*(DECEMBER 2002)., Michael J. Mazarr, "Going Just a Little Nuclear: Nonproliferation Lessons from North Korea," *International Security*, 20, no. 2 (FALL 1998): 92-122, 122., Victor D. Cha, and David C. Kang, *Nuclear North Korea: A Debate on Engagement Strategies*, (New York: Columbia University Press, 2003), 86.

⁹ Chadwick I. Smith, "North Korea: The Case for Strategic Entanglement," *Orbis*, 50, no. 2 (SPRING 2006): 343-353.

¹⁰ Ibid.

¹¹ Walter C. Jr. Clemens, "How to Cope with North Korea and Nuclear Weapons: What Bush could have Learned from Lenin, Osgood, and Clinton," *Institute for National Security Strategy*, 18, no. 2 (FALL/WINTER 2004): 221-250.

against the idea of interacting with other countries,¹² as is commonly believed and claims that the regime actively want to better its relations with other countries, especially with the United States.¹³

Lastly, engagement has often been supported and viewed under an optimistic light because of the prospect that it could induce the regime into undergoing a positive transformation, besides solving short-termed security problems.¹⁴ Kang believes this type of fundamental change has already begun,¹⁵ while Smith says North Korea is willing to change but has barred from actually implementing changes because of its economic troubles.¹⁶

1.5.1.2 Argument in favor of containment

Engagement has also earned its fair share of criticism by those whom are often labeled as being the ‘hardliners’ in the North Korean policy debate. These so-called hardliners are critical of many of the supporting claims that have been made by

¹² Kongdan Oh, and Ralph C. Hassig, "Guessing Right and Guessing Wrong about Engagement," *The Journal of East Asian Affairs*, 15, no. 1 (SPRING/SUMMER 2001): 15-41.

¹³ Ibid.

¹⁴ Randall E. Newnham, "'Nukes for Sale Cheap?' Purchasing Peace with North Korea," *International Studies Perspective*, 5, no. 2 (2004): 164-178.

¹⁵ Victor D. Cha, and David C. Kang, *Nuclear North Korea: A Debate on Engagement Strategies*, (New York: Columbia University Press, 2003).

¹⁶ Chadwick I. Smith, "North Korea: The Case for Strategic Entanglement," *Orbis*, 50, no. 2 (SPRING 2006): 343-353.

pro-engagement advocates.

To summarize the points in their arguments, hardliners are firstly of the view that it is exceptionally naïve to expect that North Korea will change as a result of sustained engagement, when in actuality North Korea appears to be nothing but highly resistant to change at whatever cost or degree. Miles says this is because preserving the status quo is deemed too critical by its leadership in maintaining its structure of rule.¹⁷ There are others, like as Stratford and Cha, whom acknowledge some degree of change to have occurred but have chosen to dismiss them on the basis of their being either a falsehood or an unintended anomaly.¹⁸

Others then claim that cooperative initiatives such as engagement will not work on the basis of past record because if experience has taught us anything, it is that North Korea rarely if ever reciprocates kind favors.¹⁹ Rather, the regime is though

¹⁷ James Miles, "Waiting out North Korea," *Survival: Global Politics and Strategy*, 44, no. 2 (2002): 37-49.

¹⁸ James D. Stratford, "Strategic Culture and the North Korean Nuclear Crisis: Conceptual Challenges and Policy Opportunities," *Security Challenges*, 1, no. 1 (NOVEMBER 2005): 123-133., Victor D. Cha, and David C. Kang, *Nuclear North Korea: A Debate on Engagement Strategies*, (New York: Columbia University Press, 2003).

¹⁹ Chadwick I. Smith, "North Korea: The Case for Strategic Entanglement," *Orbis*, 50, no. 2 (SPRING 2006): 343-353., Zhiqun Zhu, "Small Power, Big Ambition: South Korea's Role in Northeast Asian Security under President Roh Moo-hyun," *Asian Affairs: An American Review*, 34, no. 2 (2007): 67-86., James Miles, "Waiting out North Korea," *Survival: Global Politics and Strategy*, 44, no. 2 (2002): 37-49., Wade L. Huntley, "Rebels without a cause: North Korea, Iran and the NPT," *International Affairs*, 82, no. 4 (2006): 723-742., Walter C. Jr. Clemens, "How to Cope with North Korea and Nuclear Weapons: What Bush could have Learned from Lenin, Osgood, and Clinton," *Institute for National Security Strategy*, 18, no.

to be on the constant lookout for any signs of weakness that it could manipulate to its own advantage. In this respect Klinger claims that the regime would have most likely gained a huge boost in confidence knowing that a military option against it has been largely overruled due to its impracticalities.²⁰

Hardliners also point to a long list of North Korea's so-called disreputable negotiating tactics which they allege to be proof of its malignant and opportunistic tendencies.²¹ Some have even argued that that certain parties ought to be wary of contact altogether because North Korea oftentimes uses these opportunities as a chance to arouse artificial divisions within its allied opposition.²²

2 (FALL/WINTER 2004): 221-250.

²⁰ Bruce Klingner, "Deny, Deceive, and Delay: North Korea's Nuclear Negotiating Strategy," *Journal of East Asian Affairs*, 26, no. 2 (FALL/WINTER 2012): 1-24.

²¹ Jung-Hoon Lee, and Chung-In Moon, "The North Korean Nuclear Crisis Revisited: The Case for a Negotiated Settlement," *Security Dialogue*, 34, no. 2 (2003): 135-151., Glenn H. Snyder, and Paul Diesing, *Conflict Among Nations: Bargaining, Decision Making, and System Structure in International Crises*, (Princeton: Princeton University Press, 1977), 254., Scott Snyder, *Negotiating on the Edge: North Korean Negotiating Behavior*, (Washington DC: The Endowment of the United States Institute of Peace, 1999)., Bruce Klingner, "Deny, Deceive, and Delay: North Korea's Nuclear Negotiating Strategy," *Journal of East Asian Affairs*, 26, no. 2 (FALL/WINTER 2012): 1-24., Victor D. Cha, and David C. Kang, *Nuclear North Korea: A Debate on Engagement Strategies*, (New York: Columbia University Press, 2003)., Kongdan Oh, and Ralph Hassig, "North Korea in 2009: The Song Remains the Same," *Asian Survey*, 50, no. 1 (JANUARY/FEBRUARY 2010): 89-96., Yong-Sup Han, "North Korean Behavior in Nuclear Negotiations," *The Nonproliferation Review*, 7, no. 1 (SPRING 2000): 41-51.

²² Yong-Sup Han, "North Korean Behavior in Nuclear Negotiations," *The Nonproliferation*

Then in regards to its motives, hardliners presume that its only real goal at the present is to take advantage of the current situation and extract the largest amount of concessions from its partners while it still can.²³ Lee concedes that advocates may be correct in believing its nuclear activities to be the result of its concerns regarding the nation's security, but points out that they may have overlooked the possibility that North Korea might equate its nuclear capabilities too directly with its chances for survival to the extent that it would be unwilling to compromise on the issue at all.²⁴

Despite all of this, however, some hardliners do acknowledge that engagement can still be useful, but not for its typical reasons. For instance some have claim that engagement can be used as a useful means through which the regime's evil motives may be truly verified,²⁵ or as a temporary measure that is used prevent the regime from going over the brink and acting out in overt aggression.²⁶

Review, 7, no. 1 (SPRING 2000): 41-51., James D. Stratford, "Strategic Culture and the North Korean Nuclear Crisis: Conceptual Challenges and Policy Opportunities," *Security Challenges*, 1, no. 1 (NOVEMBER 2005): 123-133., Bruce Klingner, "Deny, Deceive, and Delay: North Korea's Nuclear Negotiating Strategy," *Journal of East Asian Affairs*, 26, no. 2 (FALL/WINTER 2012): 1-24.

²³ Victor D. Cha, and David C. Kang, *Nuclear North Korea: A Debate on Engagement Strategies*, (New York: Columbia University Press, 2003)., James Miles, "Waiting out North Korea," *Survival: Global Politics and Strategy* , 44, no. 2 (2002): 37-49.

²⁴ Lee, Jung-Hoon, and Chung-In Moon. "The North Korean Nuclear Crisis Revisited: The Case for a Negotiated Settlement." *Security Dialogue*. no. 2 (2003): 135-151.

²⁵ Victor D. Cha, "Korea's Place in the Axis," *Foreign Affairs*, 81, no. 3 (May/Jun2002): 79.

²⁶ James Miles, "Waiting out North Korea," *Survival: Global Politics and Strategy* , 44, no.

1.5.2 Similar studies

Thus far there have only been two studies that relied on both statistical data and VAR analysis as a means for assessing North Korea's behavior within the context of its foreign relations.

The first of these studies was by Graemes Davies who observed the interactions that occurred between North Korea and the rest of the six party members in 1990-2000. Davies divided the decade into two sub-periods, one which North Korea was ruled by its first leader Kim Il Sung and a second period in which it was ruled by Kim Jong Il. In his first set of statistical findings were those that were restricted to the events that occurred in 1990-1994, or the last five years of Kim Il Sung's reign. During these years the empirical evidence was found to be strongly in favor of engagement strategies against North Korea for North Korea seemed to have significantly factored into its foreign policy decisions the responses that it had received from other actors, namely that of the US and China. Also during this period, North Korea showed somewhat of a capacity to engage in a reciprocal relationship, both in a bilateral and triangular context. Bilaterally, North Korea was shown to reciprocate the actions of the United States and China--albeit with a clear preference towards cooperating more with the latter. For when its patterns were viewed triangularly, North Korea's cooperation levels with the United States were prone to decrease whenever its cooperation levels with China rose. The findings also showed South Korea to have played a significant role as North Korea raised its

2 (2002): 37-49.

cooperation levels towards the US when it was targeted with enhanced levels of cooperation from the South. South Korea's actions, however, were observed to have been closely modeled after the actions of the United States.

Upon entering into the second period which was when North Korea had been under the leadership of Kim Jong Il, Davies found much of the response patterns to have changed in a negative direction.²⁷ Most importantly, the North Korea of 1995-2000 no longer appeared to have been affected by the other countries. Rather, this time around, its strategic focus seemed to have rather been to cause deliberate fissures amongst its partners, namely South Korea and Japan. Owing to this, the US' efforts which operated on a rewarding system upon which cooperation levels against North Korean was heightened whenever it happened to cooperate more with its regional actors was not effective. Overall the results of the second period lead to overall conclusion that no policy of engagement or containment would be effective against that regime for as long as it remains to be so extremely insulated and unrelenting towards outside influences.²⁸

The second study was authored by Jong-Han Yoon whose analysis was conducted on the interactions that had occurred amongst the four state actors, North Korea, South Korea, China, and the United States for the years 1990-2005. For a deeper analysis Yoon's model was constructed with the inclusion of several dummy variables. There were the two that marked the terms for North Korea's two leaders

²⁷ Graeme A. M. Davies, "Coercion or Engagement? A Quantitative Test of the Effect of Regional Actors on North Korean Behavior 1990-2000," *The British Journal of Politics & International Relations*, 9, no. 3 (AUGUST 2007): 477-493,

²⁸ Ibid.

as well as several others that were added to separate the results into different periods under which South Korea and the United States were lead by liberal and conservative administrations. Yoon also added a dummy variable that flagged the periods during which South Korea and the United States had deviated in their response towards the regime. The reason for this last variable was to produce estimates that would serve to confirm or disconfirm the importance of US-ROK policy coordination.

When analyzed Yoon's estimates suggested that peace on the peninsula was determined most significantly by North Korea's actions made towards South Korea, and also to a lesser extent by North Korea actions towards the US.²⁹ In regards to its strategic response, North Korea engaged in bilaterally reciprocal behavior towards the US and triangular reciprocity towards South Korea, meaning that whenever North Korea happened to be on the receiving end of a cooperative initiative from the United States, it reciprocated towards South Korea. Policy coordination, on the other, was not shown to have been a significant factor for peace. But still lower levels of coordination did appear to have resulted from the US having shown higher levels of hostility as towards the North. But since North Korea, at the time, was operating upon a pattern of triangular reciprocity, an increase in US hostility rather prompted North Korea to lower its levels of cooperation towards South, which was the most important factor for determining the overall peace levels on the peninsula.³⁰ Thus the United States' hostility

²⁹ Jong-Han Yoon, "The Effect of US Foreign Policy on the Relationship Between South and North Korea: Time Series Analysis of the Post-Cold War Era," *Journal of East Asian Studies* , 11, no. 2 (2011): 255-287.

³⁰ Ibid.

towards North Korea was shown to have been counterproductive, both for itself and South Korea.³¹

³¹ Ibid.

2. Theoretical Framework

In this section, we will look into why distinct response patterns lead to different policy conclusions. In the process there will also be an introduction into the theoretical backgrounds that underpin these concepts that will be used in this study's analyses.

2.1 Concepts

The claim that reciprocity can lead towards less conflict and more cooperation is a claim that has been particularly informed by the liberal institutionalist school of thought. Institutionalism is a school which views international cooperation to be possible, even though states are presumed to inhabit a world that is characterized by a perpetual state of anarchy. Institutional theory is one that also accepts other core realist assumptions, such as those relating to the egoistical nature of nation states, or the lack of a governing hierarchy to enforce international agreements. The point in which they disagree with realism's general outlook on international relations is in realism's skepticism held towards international cooperation because institutionalists acknowledge the many occasions under which cooperation has occurred. The concept of reciprocity is a concept that has been often invoked by these institutionalist scholars in their attempts to make sense of such ostensible anomalies. Reciprocity is believed to be capable of facilitating the gradual emergence of cooperative relations amongst state actors whom would otherwise not engage in cooperative acts.

But the concept of reciprocity alone does not work to promote cooperative relations in and of itself. Being merely a concept that indicates "[the exchange] of roughly equivalent values in which the actions of each party are contingent on the prior actions of the others in such a way that good is returned for good, and bad for bad"

reciprocity can be beneficial if used correctly, but left unfettered, its results can also be as equally destructive.³² One need only think of an unending spiral of an arms race to see that this is true. If properly used, however, it has been argued that reciprocity can provide a pseudo mechanism of enforcement that could promote and foster cooperative relations.

Here, we detail two specific ways under which this can be achieved. The first way is through the concept of reciprocity being widely accepted as an ‘appropriate standard of behavior’ for international conduct³³ Under this circumstance, reciprocity acts much like a norm that better enables for multiple state actors to cooperate in achieving their common interests by reducing the accompanied risks and costs. Thus many institutions, and particularly those that are involved in areas of international trade and international law, have incorporated the concept of reciprocity as part of their key governing principles.

The idea however that there is an established norm of reciprocity is far less credible when interstate relations are viewed purely from within the context of their bilateral relations. For this to be argued, the empirical findings have been far too inconsistent. But here again, reciprocity can still be of use. Specifically, individual states still have the choice to utilize the concept of reciprocity by embodying it into a strategy, or foreign policy tool, such as engagement, to reinforce its role and effect on interstate relationships. Reciprocity as part of a deliberate strategy to induce a cooperative response from another country is thus its second form of use.

³² Robert O. Keohane, "Reciprocity in International Relations," *International Organization*, 40, no. 01 (December 1986): 1-27, 8.

³³ Ibid.

Robert Axelrod has authored one of the first works to affirm the usefulness of a reciprocal strategy in inducing cooperative behavior. This was because he found that a strategy which entailed a country cooperating on the first move and then reciprocating whatever response came thereafter was the optimal strategy in terms of its payoffs in an iterated prisoner's dilemma game. Axelrod posited that cooperative behavior could naturally 'evolve' when this type of tit-for-tat strategy was used, due to the other party eventually coming to the realization that defection does not pay.³⁴ Much similar to when reciprocity is being perceived as a norm, when states are able to anticipate that their actions will be reciprocated in kind, they begin to perceive cooperation as being the more rational choice of action.³⁵ But, there is a significant caveat to Axelrod's proposition. For countries who essentially regard politics as a zero-sum game there is no incentive to make any effort towards achieving mutual gains.³⁶ For them, mutual gains still result in a loss, because their goal is to gain an absolute advantage.

In this study, we term those states who behave in accordance to this type of mentality, a bully. A bully is furthermore deemed, as per the definition that has been set forth by Goldstein, to be an aggressor state that employs an inverse type of response.³⁷ An inverse response occurs when a country increases its level of

³⁴ Robert Axelrod, *The Evolution of Cooperation*, (New York: Basic Books, 1984).

³⁵ Ibid.

³⁶ Robert Jervis, "Realism, Game Theory, and Cooperation," *World Politics*, 40, no. 3 (April 1988): 317-349, 334.

³⁷ Joshua S. Goldstein, and John R. Freeman, *Three-Way Street: Strategic Reciprocity in World Politics*, (Chicago: The University of Chicago Press, 1990).

aggression when appeased, and submits when itself is met with aggression, which is the direct opposite of what would be considered a reciprocal response.

The policy implications for a bully are in reverse of that of a reciprocal actor. Towards a would-be bully state, an engagement policy would not only be ineffective, but counterproductive in the sense that it would only serve to incite the bully into heightening its level of aggression.³⁸ It goes without saying that the bully does not make an effort to reciprocate concessions. In a bully's mind, concessions are perceived as a sign of weakness. A bully is not gratuitous of kind favors, and rather attempts to exploit them in order to further its own position. Due to this tendency, engagement is rendered completely futile. This is why, for the typical bully, Goldstein prescribes a strategy which combines the use of hostile initiatives and reciprocal response.³⁹

Thus are the reasons why we must look to North Korea's behavior patterns in order to determine the best means to deal with the regime. North Korea's behavioral tendencies which reveal themselves in the record of its bilateral interactions allow for us to assess which type of approach may more effectively induce its submission to outside demands. But according to Goldstein's study, reciprocity and inverse response ought to be additionally examined amidst a triangular setting, as well. Within a triangular setting, the response types can vary similarly as they would in a bilateral setting, only the responses would stretch across multiple dyads.⁴⁰ For example, reciprocity, as it would occur in a triangular context, would be when

³⁸ Ibid.

³⁹ Ibid.

⁴⁰ Ibid.

country A cooperates with country B as a result of having experienced an increase in cooperation from country C. Conversely, a triangular inverse response would be when country A becomes more hostile with country B as a result of having received cooperative initiatives from country C.⁴¹ When countries together seek to modulate the behavior of another country, as the six party coalition aims towards doing in regards to North Korea, it makes sense to look into triangular patterns as it would be able to indicate how a coalition ought to strategize as a whole.

To complete the spectrum of possible response patterns, we lastly look to the element of policy inertia. Policy inertia is a measure of how much a country relies on pre-established procedure in formulating a response to a problem that exists in the present.⁴² This tendency has been the subject of review in G.T Allison's model II, or the organizational process paradigm, where it is posited that the best way to predict a country's future choices is to review its recent decisions.⁴³ In this model, Allison claims that though a country's present response may appear as being slightly modified, overall it will be pretty much the same as it was in the past.⁴⁴ This organizational tendency to adhere to what Allison terms standard operating procedures (SOPs) is what leads to policy inertia.⁴⁵

Allison goes on to explain that countries rely on SOPs out of necessity, because

⁴¹ Ibid.

⁴² Ibid.

⁴³ G. T. Allison, *Essence of Decision*, (Boston: Little, Brown, 1971).

⁴⁴ Ibid.

⁴⁵ Ibid.

their resources are constrained, and it is realistically impossible for the head of an organization cannot deal with every problem individually.⁴⁶ Hence problems that are of a regular occurrence are naturally passed down to be dealt with in the organization's lower ranks who in turn abide to the SOP.⁴⁷ In this way SOPs are congruent with the goal of organizational efficiency and are of a natural occurrence for large organizations.⁴⁸

But what is significant when it comes to policy inertia is that it competes with another tendency that leads organizations to respond more directly to their developing external environment. McClelland hypothesizes that the stronger the reactionary tendency the more likely a country will embark on a learning process through which it will alter its behavior to better deal with the immediate circumstances of its environment, or the reinforcement and/or punishments that it receives from other countries.⁴⁹ Hence, policy inertia is somewhat of an obstructive element for policies such as engagement and containment to be able to take effect in modulating another country's behavior.⁵⁰

But like any other type of response, levels of policy inertia may also be subject to change. Change is likely to occur when a country is confronted with novel and

⁴⁶ Ibid.

⁴⁷ Ibid.

⁴⁸ Charles A. McClelland, "The Acute International Crisis," *World Politics*, 14, no. 01 (October 1961): 182-204, 18.

⁴⁹ Ibid.

⁵⁰ Ibid.

highly threatening circumstances, such as when it happens to encounter an acute crisis.⁵¹ During instances of crisis, countries divert from their routinized SOPs and engage in a proactive search for a better organizational response, though thresholds would vary from organization-to-organization, and from country-to-country.⁵² Additionally, this search can also be triggered by too much observed failures of an established SOP.⁵³ This would also mean that if a country is fully satisfied with its present results, it would thus become less reactionary and exhibit a higher degree of policy inertia in dealing with a particular issue.

2.2 Richardson's model

Like many that came before it, this study bases its methodology on a pre-existing model authored by the English physicist and mathematician Lewis Fry Richardson. In the beginning, its original purpose was to gain an understanding the operating natures of an arms race. But owing to the model's unique applicability of which the author himself had pointedly acknowledged, the model has been of increasing use in the examination of reciprocity trends amongst individual nation states. This model, which has now become known as the Richardson model, has proven itself to be particularly useful in furthering the quantitative genre and study of

⁵¹ G. T. Allison, *Essence of Decision*, (Boston: Little, Brown, 1971), Raymond Tanter, "International System and Foreign Policy Approaches: Implications for Conflict Modeling and Management," *World Politics*, 24 (SPRING 1969): 7-39., Charles A. McClelland, "The Acute International Crisis," *World Politics*, 14, no. 01 (October 1961): 182-204, 19.

⁵² G. T. Allison, *Essence of Decision*, (Boston: Little, Brown, 1971), 14.

⁵³ Ibid.

sociopolitical phenomena due to its specific ability to translate political events into empirical bits of knowledge and insights. This it does through a mathematical formula tested on a time series data which essentially converts the relevant political events of the real world into their statistical representations. But as has already been mentioned, research findings have been majorly inconclusive. Because while some studies indeed have found reciprocity to be of a notable occurrence, others have rather detected more significant occurrences of inverse response, and still others have discovered policies to have been largely self-driven due to policy inertia. Moreover the collective scope of research has been mostly restricted to the analysis of superpower dynamics with only a few exceptions which includes those few which have been conducted on North Korea.

The Richardson model itself is but a system of differential equations, whereupon a country's behavior is presumed to be the combined and weighted function of three factors. These factors are: (1) a country's own behavior taken against another country (2) another country's behavior against its self and (3) 'grievances,' which are additional motives held by the state leadership presumed not to have originated from factors (1) and (2).⁵⁴ Hence on the left side of every equation would appear the dependent variable representing one country's actions undertaken at time t , which would reappear on the right-hand side of every equation in the model, but at $t-1$, because all variables are treated to be endogenous. More variables would thus result in additional equation as well as an additional right side coefficient for every equation in the model. For further explanation, let us assume of a model constructed on the dyadic relations of countries X and Y, which according to the

⁵⁴ Lewis F. Richardson, *Arms and Insecurity: A Mathematical Study of the Causes and Origins of War*, (Pittsburgh: Boxwood Press, 1960), 14-16.

Richardson tradition would be expressed as:

$$\Delta X_t = \beta_{11} Y_{t-1} + \beta_{12} X_{t-1} + g_1^{55}$$

$$\Delta Y_t = \beta_{12} X_{t-1} + \beta_{22} Y_{t-1} + g_2$$

This would be the Richardson model in its most basic form. When testing for patterns of behavioral response it would be further inputted with a data set that is a statistical time series representative of a country actions in terms of their estimated levels of ‘net cooperation,’ which is calculating through subtracting the levels of cooperation from the levels of hostility.⁵⁶

Once the model has been formed, the researcher would then proceed to conduct a regressions analysis. From its results which may evidentially indicate the existence any one of the behavioral responses that have been so far discussed. The key condition in detecting most of the responses is that the relevant coefficients be statistically significant and positive in sign.⁵⁷ For example, when the defense coefficients β_{11} and β_{12} are shown to be significant and positively signed, it would be an indication of reciprocity.⁵⁸ But if β_{11} were to be observed to be significant yet negative in sign it would indicate that country X has rather operated on a policy of

⁵⁵ Joshua S. Goldstein, and John R. Freeman, *Three-Way Street: Strategic Reciprocity in World Politics*, (Chicago: The University of Chicago Press, 1990).

⁵⁶ Richardson, Lewis F. *Arms and Insecurity: A Mathematical Study of the Causes and Origins of War*. Pittsburgh: Boxwood Press, 1960.

⁵⁷ Ibid.

⁵⁸ Ibid.

inverse response against country Y.⁵⁹ Identifying the existence or nonexistence of policy inertia would occur in a similar manner. Policy inertia is detected through significant and positive ‘fatigue’ coefficients (β_{12} and β_{22}),⁶⁰ while negatively signed coefficients would indicate an opposite trend away from inertia. Terms g_1 and g_2 are then the aforementioned ‘grievances,’ which are generally regarded as constants, but theoretically may change in the long-run as countries undergo a gradual change in their held images and/or expectations in regards to the other country in the observed dyad.⁶¹ In fact it has been argued that reversing the signs of the grievance terms, from negative to positive, would be the ideal accomplishment for a country relying on a tit-for-tat strategy (reciprocity combined with cooperative initiatives) to promote cooperative relations.⁶² In this particular study, however, the grievance terms will not be attributed an in-depth observation or analysis.

⁵⁹ Ibid.

⁶⁰ Lewis F. Richardson, *Arms and Insecurity: A Mathematical Study of the Causes and Origins of War*, (Pittsburgh: Boxwood Press, 1960), 14., Joshua S. Goldstein, and John R. Freeman, *Three-Way Street: Strategic Reciprocity in World Politics*, (Chicago: The University of Chicago Press, 1990), 23.

⁶¹ Lewis F. Richardson, *Arms and Insecurity: A Mathematical Study of the Causes and Origins of War*, (Pittsburgh: Boxwood Press, 1960), 16.

⁶² Joshua S. Goldstein, and John R. Freeman, *Three-Way Street: Strategic Reciprocity in World Politics*, (Chicago: The University of Chicago Press, 1990).

3. Research Question and Hypotheses

Having identified the gap in opinions on North Korea policy, and having established a conceptual as well as a methodological framework for an empirical test in regards to North Korea behavioral response patterns, we now establish this study's leading research question as follows: Does North Korea's actions that have occurred during the first decade of the crisis adhere to the definition of a bully, or that of an engageable partner?

In relation to the research questions, the following hypotheses have been developed:

Hypothesis 1 (Bilateral Reciprocity): The net cooperation of a bilateral partner at a prior moment in the time series will positively correlate with the later net cooperation of North Korea towards that same partner.

Hypothesis 2 (Inverse Response, or 'Bullying'): The net cooperation of a bilateral partner at a prior moment in the time series will negatively correlate with the later net cooperation of North Korea towards that same partner.

Hypothesis 3 (Reciprocal Triangular Response): The net cooperation of a bilateral partner at a prior moment in the time series towards North Korea will positively correlate with the later net cooperation of North Korea towards a bilateral partner in another dyad. also been established

Hypothesis 4 (Inverse Triangular Response, or Triangular 'Bullying'): The net cooperation of a bilateral partner at a prior moment in the time series towards North Korea will negatively correlate with the later net cooperation of North Korea towards a bilateral partner in another dyad.

4. Methodology

4.1 Data

For this study's quasi-experiment I relied on a set of variables that were constructed through the usage of event data. Event data are the codified records of state interactions which have been longitudinally observed, scaled, and then weighed. Event data enables for the statistical analyses of variety of socio-political phenomena which are otherwise and is generally presumed to be unquantifiable. Event data can also be used to construct the variables to be inputted into a variety of mathematical formulas to produce meaningful coefficients for interpretation, as would be done in this study through VAR modeling.

For the purposes of this study, it was required that an entirely new data set be manually constructed prior to experimentation, and this was despite the fact that several pre-constructed data sets exist and are made available by databanks such as IDEA and the World Event/Interactions survey (WIES). Unfortunately, none of them had offered a data set that was particularly applicable for the time period and set of actors that were specified in this study's hypotheses.

Thus the construction of an event data set occurred in four phases worth of data transformation, which was done in adherence to the coding procedures outlined in the Conflict and Peace Data Bank (COPDAB) codebook.⁶³ For the historical data, I relied on articles sourced from the Associated Press newswire agency, a news organization that is renowned for its extensive coverage of international political

⁶³ Edward E. Azar, *The Codebook of the Conflict and Peace Data Bank (COPDAB)*, (Mimeo: University of North Carolina at Chapel Hill, 1980).

events.

The first phase was the coding of the events wherein the researcher is required to extract what are called 'event statements' from the relevant descriptive events that had been identified in news articles.⁶⁴ Here descriptive events apply to all economic, political, or military acts including verbal statements. When identified as being relevant to one of the two dyads to be examined, these descriptive events are then accorded separate entries into the database along with some other details regarding their circumstances. Among others, an active verb, representative of the action that had been taken, was needed to be specified for the purpose of providing a brief description of the event. There was also needed to be an identified an 'actor,' and 'target,' for the purpose of later calculating the values according to each direction of the dyads. When the first phase had been completed, a total of 2104 descriptive events were recorded into the database.

In the second phase of transformation, these events had to be scaled. Scaling meant that the recorded entries had to be ordered along a 15-point international scale, with each scale point representing the level of cooperation or hostility symbolized by each descriptive event. This task was done in adherence to Azar's international scale of events, also included within the codebook, where cooperative acts could possibly range from a scale of 1-7 and conflictive acts from a scale of 9-15.

The purpose of the scale-points was so that the researcher could perform the next phase of data transformation, which was assigning the proper weights to each scale-point. Weights are the actual measurements for the degrees of cooperativeness versus hostility that is inferred based on the circumstances of the

⁶⁴ Ibid.

act and/or statement. And although weighting schemes vary across different methods of event data construction, Azar's had been one that was created based on answers that were generated in a survey circulated amongst field experts of political science. Hence, this was a process in which the descriptive events were actually transformed into quantifiable data statistics. Once it had been completed, all scaled interactions are attached with, and represented by actual numerical values. When added together, these values were measurable on a single dimension of hostility minus cooperation. By subtracting the weighted sum of cooperation values from the sum of hostility values I was thus able to calculate the net cooperation values.

Lastly, to finalize this entire process, I took note of the common practice as well as widely recommended procedure that the weighted values of all interactions be aggregated on a temporal basis. This concluding phase was intended to produce periodic summaries of net cooperation across regular intervals of time. The data that is produced through aggregation is also termed to be the 'analytic data.'⁶⁵ For technical reasons, temporal aggregates are considered crucial, because without aggregations computations of net cooperation would have to occur on a daily basis due to the constructed nature of an event data set, which is problematic because such practice would easily result in problems of auto-correlation.⁶⁶ Additionally aggregations can also be beneficial because they can serve to minimize the number

⁶⁵ Edward E. Azar, *The Codebook of the Conflict and Peace Data Bank (COPDAB)*, (Mimeo: University of North Carolina at Chapel Hill, 1980).

⁶⁶ Graeme A. M. Davies, "Coercion or Engagement? A Quantitative Test of the Effect of Regional Actors on North Korean Behavior 1990-2000," *The British Journal of Politics & International Relations*, 9, no. 3 (AUGUST 2007): 477-493, 481.

of data units with a value of 0.⁶⁷

Unlike in the process of scaling or weighting, there was no set standard for determining the aggregation units. Goldstein, however, has claimed sub-annual aggregations as being more preferable as opposed to annual ones as annual aggregates may lead to overaggregation.⁶⁸ This, in effect, makes it unlikely that a statistical model would be able to discern of a causal relationship later on.⁶⁹ In consideration of Goldstein's recommendation as well as the choices that have been made in other similar studies, it was determined that the event data used for this study should be aggregated on a weekly basis. The finalized analytic data resulted in a total of 518 analytic data units for the VAR model.

And though net cooperation values alone does not hold much value in analytical terms, when graphed they can be revealing of certain trends.⁷⁰ For instance in figure 1.1 we are able to see that net cooperation levels on part of the United States towards North Korea were at their record lowest levels during the latter half of year 2006 which was when North Korea conducted its first nuclear test. Figure 1.2 then shows that North Korean levels spiked precipitously downwards during the early months of 2003 when North Korea engaged in a series of provocative acts signaling its intention to recommit to nuclear development. Graphs 1.3 and 1.4 also reveal that North and South Korea were mutually hostile against each other during

⁶⁷ Ibid.

⁶⁸ Joshua S. Goldstein, "Reciprocity in Superpower Relations: An Empirical Analysis," *International Studies Quarterly*, 35, no. 2 (June 1991): 195-209, 198.

⁶⁹ Ibid.

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mid 2010, which was approximately when the Cheonan incident had created tensions between the two countries.

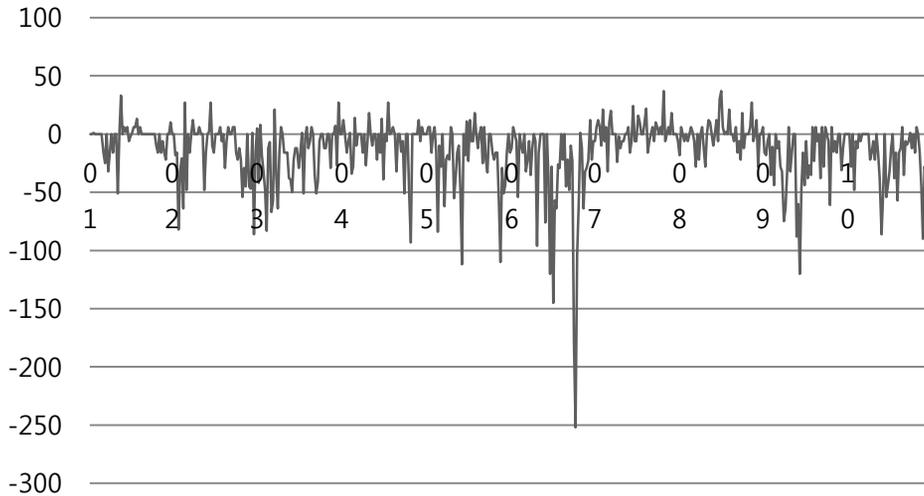


Figure 1.1 Net Cooperation Time Series for US Actions toward North Korea

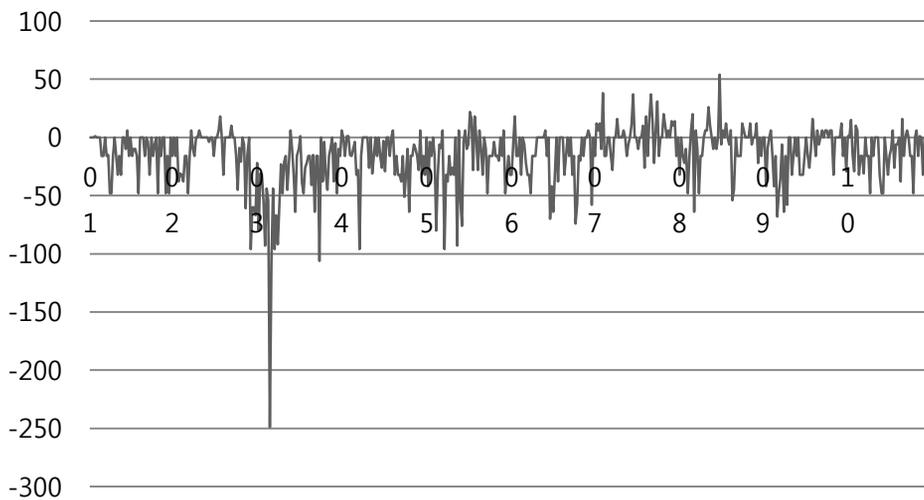


Figure 1.2 Net Cooperation Time Series for North Korean Actions toward United States

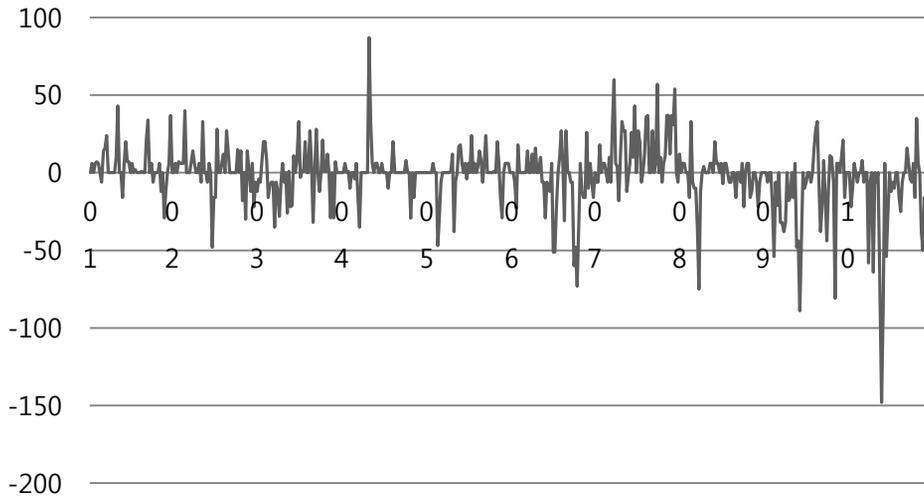


Figure 1.3 Net Cooperation Time Series for South Korean Actions toward North Korea

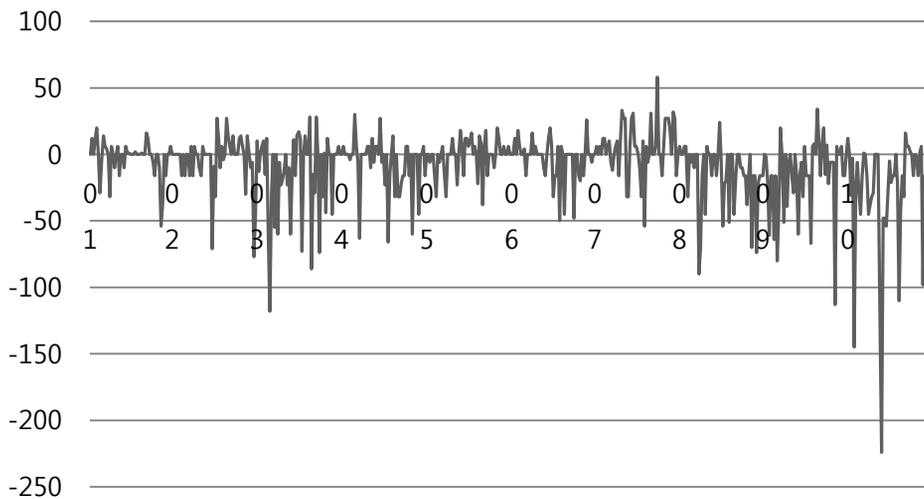


Figure 1.4 Net Cooperation Time Series for North Korean Actions toward South Korea

4.2 Model and methods

The method that will be used to estimate the coefficients to be used in our analyses, essentially serving to confirm or disconfirm the validity of our hypotheses, is vector autoregression (VAR). VAR is a statistical model that can provide the required estimates for the correlation coefficients based on a multivariate time series. In my case, those variables were the net cooperation values that had been earned in the previous section through the constructed event data which have been operationalized in (1.1).

UD: Represents net cooperation values for the US in its actions towards the DPRK

DU: Represents net cooperation values for the DPRK in its actions towards the US

(1.2)⁷¹

RD: Represents net cooperation values for the ROK in its actions towards the DPRK

DR: Represents net cooperation values for the DPRK in its actions towards the ROK

But before going into constructing these variables into their structural and reduced forms, I will briefly overview some general features and strengths of a VAR model.

VAR is typically used as a tool for econometrics, however many have also come to acknowledge its varied uses for in conducting empirical analyses in the field of

⁷¹ Graeme A. M. Davies, "Coercion or Engagement? A Quantitative Test of the Effect of Regional Actors on North Korean Behavior 1990-2000," *The British Journal of Politics & International Relations*, 9, no. 3 (AUGUST 2007): 477-493.

political science. And within the field of political science, the usage of VAR modeling techniques has been particularly prevalent within those studies which have similarly looked for reciprocal patterns occurring amongst states, such as those of Davies and Yoon. The reason that the VAR approach has been so distinguished amongst other statistical models is in large part owing to the fact that VAR imposes weaker restrictions and fewer requirements during the stage of theory-building.⁷²

In constructing a VAR model, the researcher does not necessarily have to account for all the variables and can instead opt to test for only the ones that have been specified in a restricted theory.⁷³ This has proven to be a rather useful aspect of the model, especially for researchers that have sought to examine the coefficients related to sociopolitical phenomena because when compared with economic trends, sociopolitical trends are relatively more complex and borne out of a multitude of contributing factors that cannot be expressed in quantitative terms.⁷⁴ For instance, in this study I am unable to account for domestic factors owing to the fact that they are virtually unknown, especially but not only in the case of North Korea. Because of this I expect R-squared estimates to be low, but due to the strengths of VAR the

⁷² John R. Freeman, John T. Williams, and Tse-min Lin, "Vector Autoregression and the Study of Politics," *American Journal of Political Science*, 33, no. 4 (November 1989): 842-877, 854.

⁷³ John R. Freeman, John T. Williams, and Tse-min Lin, "Vector Autoregression and the Study of Politics," *American Journal of Political Science*, 33, no. 4 (November 1989): 842-877, 854., Joshua S. Goldstein, and John R. Freeman, *Three-Way Street: Strategic Reciprocity in World Politics*, (Chicago: The University of Chicago Press, 1990), 70, n.5.

⁷⁴ Graeme A. M. Davies, "Coercion or Engagement? A Quantitative Test of the Effect of Regional Actors on North Korean Behavior 1990-2000," *The British Journal of Politics & International Relations*, 9, no. 3 (AUGUST 2007): 477-493, 484.

produced coefficients or rather the joint statistical significance of coefficients will still make for meaningful observations.⁷⁵ In fact, Freeman has argued in favor of the less restrictive VAR approach in the study of politics, as its results were more likely to be superior to those that have been produced by a competing model requiring for stronger theoretical assumptions which may often be conceived at the price of being accurate.⁷⁶

The second advantage of VAR results from its a priori assumption of endogeneity for its variables. An a priori assumption of endogeneity renders all variables to be open to feedback which would be well representative of the realities of international politics where the behaviors of states are prone to affecting each other rather than influences only flowing in one direction. Hence in the to-be-constructed model, all variables will appear once on the left hand side of an equation as the dependent, as well as in all equations on the right hand side as the independent.

Causal inferences are then made after estimates have been earned through granger causality or an impulse response analysis. The latter will be the one that I have used for this study's analysis and wherein a one standard deviation shock, or innovation, is simulated in giving a moving average representation (MAR) that is estimated on the basis of past accumulated shocks and errors. For the purposes of this study, these simulated shocks will be interpreted as being the resultant behavior due to some 'surprise foreign policy initiative' enacted by another

⁷⁵ Ibid., John R. Freeman, John T. Williams, and Tse-min Lin, "Vector Autoregression and the Study of Politics," *American Journal of Political Science*, 33, no. 4 (November 1989): 842-877, 845.

⁷⁶ John R. Freeman, John T. Williams, and Tse-min Lin, "Vector Autoregression and the Study of Politics," *American Journal of Political Science*, 33, no. 4 (November 1989): 842-877, 855.

country.⁷⁷ Thus impulse response will essentially be able to reveal the type of response that results from a cooperative initiatives that when applied continually would essentially amount to a policy of engagement.⁷⁸ The MAR will then be viewed together with the signs of the relevant coefficients in generating conclusions on whether response patterns in general have tended to be positive or negative in nature.

But first, let us think back to Richardson’s assertions regarding state behavior, which I have used as a basis for positioning my variables in the order of their presumed functional relationship, or reduced form, in (1.1):

$$\begin{aligned}
 UD_t &= f_1 (UD_{t-1}, RD_{t-1}, DU_{t-1}, DR_{t-1}; e_{1t}) \\
 RD_t &= f_2 (UD_{t-1}, RD_{t-1}, DU_{t-1}, DR_{t-1}; e_{2t}) \\
 DU_t &= f_3 (UD_{t-1}, RD_{t-1}, DU_{t-1}, DR_{t-1}; e_{3t}) \\
 DR_t &= f_4 (UD_{t-1}, RD_{t-1}, DU_{t-1}, DR_{t-1}; e_{4t})
 \end{aligned}
 \tag{1.1}^{79}$$

These structural forms incorporate the qualitative assumption that the present behaviors of North Korea, the United States, and South Korea would be a function of their own past behaviors, the past behaviors of their bilateral partner, and the

⁷⁷ Ibid, 847.

⁷⁸ Joshua S. Goldstein, and John R. Freeman, *Three-Way Street: Strategic Reciprocity in World Politics*, (Chicago: The University of Chicago Press, 1990), 70.

⁷⁹ Ibid.

past interactions that have occurred from within a second dyad.⁸⁰ In other words, it is but a reiteration of Richardson's assertions minus the last element which was an addition that was made in order to further examine the effects of triangularity, in addition to bilateral response patterns.⁸¹ Attention was also given to the ordered sequence of the variables because VAR models and innovative accounting processes are sensitive to the ordering of variables in producing their results.⁸² Specifically, variables were positioned so that the stronger country, which would be the United States, would come first in order followed by South Korea and then North Korea. This sequence of order is in reference to the alleged reality of international politics where influence is regarded to flow downwards from the strongest country to the weakest.⁸³

Next we look to the actual VAR model, which I have developed from (1.1):

$$\begin{aligned}
 UD_t &= \beta_{10} + \sum \beta_{11i} UD + \sum \beta_{12i} RD + \sum \beta_{13i} DU + \sum \beta_{14i} DR + e_1 \\
 RD_t &= \beta_{20} + \sum \beta_{21i} UD + \sum \beta_{22i} RD + \sum \beta_{23i} DU + \sum \beta_{24i} DR + e_2 \\
 DU_t &= \beta_{30} + \sum \beta_{31i} UD + \sum \beta_{32i} RD + \sum \beta_{33i} DU + \sum \beta_{34i} DR + e_3
 \end{aligned}
 \tag{1.3}^{84}$$

⁸⁰ Lewis F. Richardson, *Arms and Insecurity: A Mathematical Study of the Causes and Origins of War*, (Pittsburgh: Boxwood Press, 1960).

⁸¹ Joshua S. Goldstein, and John R. Freeman, *Three-Way Street: Strategic Reciprocity in World Politics*, (Chicago: The University of Chicago Press, 1990).

⁸² Ibid.

⁸³ Ibid.

⁸⁴ Ibid.

$$DR_t = \beta_{40} + \sum \beta_{41i} UD + \sum \beta_{42i} RD + \sum \beta_{43i} DU + \sum \beta_{44i} DR + e_4$$

In a VAR model each variable is to be regressed on the lagged values of all the variables as well on a constant and error term. Lags are applied because (1.2) has expressed its variables as being a function of behaviors that have occurred in the past.

Having conducted a regressions analysis on these lagged variables, I was able to estimate the model coefficients for each of the lagged terms. These coefficients are then subjected to two more stages worth of data analysis. The first of these tests consists of a block f-test on all of the lagged variables combined. An f-test is a statistical test that computes an estimate for the joint statistical significance of all lagged terms as opposed to just one. The reason for conducting the f-test was because individual coefficients for each of the lagged terms on their own matter less than the block coefficients of all lagged terms.⁸⁵ Thus from the f-test I was able to earn the chi-squared and p values. The higher the chi squared values indicates a higher degree of deviation from the null hypothesis which would be the lack of any correlation.

Alongside the chi-squared, will be reported the P values to differentiate the strength of the evidence. In this study, I consider .10 as the cutoff point for my p-values. This means that observations accompanied by a p value that are higher than .10 will not be regarded as holding statistical significance and incapable of rejecting the null.

The second and last stage of data analysis consisted of simulated impulse response,

⁸⁵ Joshua Goldstein, Jon C. Pevehouse, "Reciprocity, Bullying, and International Cooperation: Time-series Analysis of the Bosnia Conflict." *The American Political Science Review*, 91, no.3 (September 1997): 515-529, 523.

also known as innovative accounting. As said before, the impulse response simulates a one standard deviation ‘shock’ into the system. The resulting MAR produces a summary of what the resultant impact would look like and which will serve to clarify the direction of a response. Based on MAR we are able to know whether a correlation was borne because country A responded to country B or if it was because country B was responding to country A. When the MAR has been viewed together with the p-levels we will be able to know if reciprocity (or inverse response) had been in effect and by which country it had been employed.

4.3 Model Specification

Prior to estimating the VAR model I conducted two tests for model specification. The first of these tests was a check on the temporal stability of coefficients. Checking for temporal stability is a commonly recommended process especially when dealing with a statistical model that has been inputted with a time series. And though there are many ways to conduct a test on temporal stability, for this study I utilized CUSUM, or a cumulative sum control chart to identify structural breaks, or “break points,” which mark the beginning and end of a period (or periods) that had produced generally stable coefficients.⁸⁶ Besides a statistical test, one may also reference breakpoints as they had been identified qualitatively by other authors.⁸⁷ But for this study, I have chosen to rely primarily on the results of the CUSUM test and reference back to the qualitative literature in order to affirm their significance.

From the CUSUM chart I identified two instances of a breakpoint. One occurred in

⁸⁶ Joshua S. Goldstein, and John R. Freeman, *Three-Way Street: Strategic Reciprocity in World Politics*, (Chicago: The University of Chicago Press, 1990).

⁸⁷ Ibid.

October of 2006, approximately around the time of North Korea's first nuclear test. Before this first breakpoint I identified the first stable period to have spanned six years starting from 2001 to September 2006. Three hundred and two observations lay in this period. The second period of stability lasted five years and was initiated from the time of the first breakpoint which had occurred to the second and last breakpoint in August of 2010. Note that this was also a time during which tensions had been subjected to grow significantly due to the sinking of the South Korean warship and of which North Korea was largely considered to be the prime suspect.

In terms of data, the second period of stability encompassed 203 weekly observations, from weeks 303 to 506. From the second breakpoint onwards to the end of the remainder of the observations, coefficients were charted as being unstable, and therefore had subsequently been eliminated from further analysis. However due to the shortage of data for this period, it was unclear as to whether instability indicated a third break point or a period of "temporary instability"; either way it would have had no bearing on this study's conclusions.⁸⁸ Model estimates were also conducted separately for the two periods with stable coefficients, with the expectation that they were likely to produce different results in terms of observations made on behavioral patterns.⁸⁹

The second part of model specification was then to determine the appropriate lag lengths to be applied to the variables in the model. Much like tests for temporal stability, testing for the optimum number of lags was another procedure that is

⁸⁸ Joshua S. Goldstein, and John R. Freeman, *Three-Way Street: Strategic Reciprocity in World Politics*, (Chicago: The University of Chicago Press, 1990), 73.

⁸⁹ Joshua Goldstein, Jon C. Pevehouse, "Reciprocity, Bullying, and International Cooperation: Time-series Analysis of the Bosnia Conflict." *The American Political Science Review*, 91, no.3 (September 1997): 515-529, 524.

generally considered to be crucial when dealing with statistical models that been fitted with a time series. For the circumstances of this study, the number of optimum lags essentially would be the answer to the question of ‘how long does it take for one country to respond to another’s behavior?’⁹⁰ And there are numerous methods to determine the optimum number of lags. In this case, I have chosen to rely on a collection of estimates garnered by the utilization of likelihood ratio, final prediction error, Akaike information criterion, Schwarz information criterion, and Hannan-Quinn information criterion. Thus five estimates were computed in three sets--one for each stable period of stability and an additional estimate accounting for the overall period. Based on these results, the actual numbers of lags that were used in the final model were the ones that had been selected the most amongst the five criteria. As it turned out, the appropriate numbers of lags were observed to be 3 lags for the first period, 1 lag for the second period, and 3 lags for the entire length of observations.

⁹⁰ Joshua S. Goldstein, and John R. Freeman, *Three-Way Street: Strategic Reciprocity in World Politics*, (Chicago: The University of Chicago Press, 1990), 71.

5. Findings and Analysis

5.1 Entire period

The entire period of observed data is being reviewed despite the results of our model specification. This is so that an overview of the entire decade could be made as part of a preliminary procedure upon which we may earn our first impressions, though its estimates will have little to no bearing on my conclusions. Here I will also demonstrate how estimates have been subjected to interpretation.

Table 1.1

F-Test Results for Entire Period

| Dependent Variable | Independent Variable | Chi-square | Significance | R-Squared |
|--------------------|----------------------|------------|--------------|-----------|
| UD | UD | 43.83250 | .0000*** | .185868 |
| | DU | 6.330573 | .0966+ | |
| | RD | 3.459869 | .3260 | |
| | DR | 3.071104 | .3808 | |
| DU | UD | 4.807519 | .1864 | .207591 |
| | DU | 70.47490 | .0000*** | |
| | RD | 3.128519 | .3722 | |
| | DR | 1.413849 | .7023 | |
| RD | UD | 17.59932 | .0005*** | .216346 |
| | DU | 2.700197 | .4402 | |
| | RD | 20.85843 | .0001*** | |
| | DR | 13.84302 | .0031** | |
| DR | UD | 0.216784 | .9748 | .097466 |
| | DU | 0.393193 | .9416 | |
| | RD | 10.37270 | .0156* | |
| | DR | 9.588574 | .0224* | |

*** = $p < .001$; ** = $p < .01$; * = $p < .05$; + = $p < .10$.

NOTE.— Model consists of weekly data observations numbered 1-526 ($n=518$).

The produced estimates for the entire period are shown in table 1.1. As was suspected, this model yielded generally low R-squared estimates. This means that

this model is unable to account for all the variation that has occurred within the observed variables. Specifically it can only account for approximately 20 percent of the variation that has occurred in relation to the variables UD, DU, and RD, and only 9 percent for the variable DR. From the beginning, I shall state that this will be trend that will continually affect my other models that are pertinent to the two sub-periods, regardless of their having been further specified. Nevertheless I deem these R-squared values to be acceptable because the model has been constructed with the omission of any domestic factors.

The variable DR will also be the one to be accompanied with the lowest R-squared estimates in all periods, meaning that this model is least fitting and least able to account for the actions of North Korea that have been undertaken towards its Southern neighbor.

We now look to the estimates of table 1.1 statistics that have to do with identifying the behavioral patterns of the three state actors. Most conspicuous in these findings are the estimates for policy inertia which is shown to be by far the most prevalent behavioral pattern to have occurred. Policy inertia has appeared to be statistically significant for all the actors in the model. This, I am able to surmise by first looking at the levels of probability of the correlated coefficients for each variable and the explanatory variable that represents the actions made by its own self in the recent past, and then secondly by referencing the impulse response simulations that have been included in the appendix.

Table 1 shows that for the variable UD, DU and RD the relevant levels of probability, or significance, were all recorded at their highest attainable levels, $p < .001$. Their correspondent MARs were also all charted to be positive. This means that when these countries happened to encounter a positive initiative made in their

direction, they were more likely to repeat their actions which have been made in the recent past rather than suddenly devising of a new and unexpected response. Similarly DR was also shown to be statistically significant in its correlation with its own self, but at a slightly lower level at $P < .05$.

Next we look towards evidences of patterns of bilateral response. Here again, I look to the significance levels of the variables in their correlation with their direct opposites (for example the dependent variable UD and the independent variable DU) and cross check these estimates with the charted response patterns of the correspondent impulse response simulations in order to affirm its direction. If the correspondent MAR is charted to be positive then I conclude that a country has exhibited a pattern of bilateral reciprocity. Then if the MAR is charted to be generally negative I would conclude that a country has exhibited a pattern of inverse response. An MAR that fluctuates between being both positive and negative will be deemed to be ambiguous and hence indicative of neither reciprocity nor inverse response.

Based on this method of interpretation, I observe there to have been two patterns of reciprocity in relation to the variables RD and DR for the model that was fitted with all the data. In other words, North Korea and South Korea both appeared to have reciprocated against each other, though South Korea did so at a higher level of significance at $p < .01$ than North Korea which did so at $p < .05$. Estimates and impulse response simulations also affirmed that the United States reciprocated against North Korea at the lowest acceptable level of $p < .10$.

For this model, I also observed there to have been one evidence of triangularity in the case of RD in relation to UD at $p < .001$. This meant that South Korea's actions made towards North Korea correlated strongly with the United States' actions

towards North Korea. Having cross-checked these results with the correspondent impulse response simulations, which turned out to be positive, I inferred that South Korea had exhibited a pattern of reciprocal triangularity in this relationship. In other words, for the entire period, there was strong evidence that South Korea had been modulating the behavior of the United States towards its actions taken against North Korea.

This concludes my observations based on the estimates produced by my model made for the entire period during which I have found strong and universal evidence of policy inertia, a few occurrences of bilateral reciprocity, namely amongst the two Koreas, and a single occurrence of reciprocal triangularity. For this model there was absolutely no evidence that was indicative of inverse response. And even for the MARs simulated for the remainder of coefficients which were not estimated to have been significant, there was no single instance in which they had been charted to be negative. Of course these findings were generated by a model that has not been specified in adherence to my temporal stability tests, and would stand to be less accurate. Thus we now move on to the analysis of the two stable sub-periods which will provide a more definitive evaluation of these patterns and which will allow me to determine whether to accept or reject this study's hypotheses.

5.2 First period of stability

Table 1.2

F-Test Results for First Period of Stability

| Dependent Variable | Independent Variable | Chi-square | Significance | R-Squared |
|--------------------|----------------------|------------|--------------|-----------|
| UD | UD | 16.53658 | .0009*** | .143993 |
| | DU | 11.38424 | .0098** | |
| | RD | 2.456171 | .4833 | |
| | DR | 2.706949 | .4390 | |
| DU | UD | 7.940698 | .0473* | .213312 |
| | DU | 22.26373 | .0001*** | |
| | RD | 2.390769 | .4954 | |
| | DR | 1.571988 | .6658 | |
| RD | UD | 2.767972 | .4288 | .104903 |
| | DU | 6.382150 | .0944+ | |
| | RD | 6.717464 | .0815+ | |
| | DR | 4.892417 | .1798 | |
| DR | UD | .867553 | .8333 | .104903 |
| | DU | 9.547134 | .0228* | |
| | RD | 1.858262 | .6023 | |
| | DR | .900353 | .8253 | |

*** = $p < .001$; ** = $p < .01$; * = $p < .05$; + = $p < .10$.

NOTE.— Model consists of weekly data observations numbered 1-302 ($n=290$).

This model, which also happened to yield generally low R-squared values, produced estimates, displayed in table 1.2., that were substantially different from those that had been produced by the unspecified overall model. For one, the detected patterns of policy inertia were far less prevalent than they had been in the previous model where patterns of inertia had been detected for all the variables. In this model, or during the years 2001-2006, only three out of the four variables, UD, DU, and RD exhibited significant levels of policy inertia.

Secondly, reciprocity did not occur amongst South and North Korea, but by North

Korea towards the United States at $p < .05$. In fact North Korea reciprocated towards the United States even when the United States apparently did not make an equal effort in returning the favor. For even though the significance levels of UD to DU did indicate that the United States was influenced strongly by North Korea's behavior (indicating there to be some type of bilateral response in play), the direction of this response was shown to be ambiguous from its MAR which charted both above and below the zero line.

A third point of difference from the previous model was that triangular patterns were exhibited not by South Korea, but by North Korea. North Korea in its actions towards South Korea was shown to be strongly correlated with DU. The corresponding MAR then revealed this correlation to have been positive in direction—meaning that whenever North Korea happened to cooperate with the United States it subsequently increased its cooperation levels with the South. This type of pattern is what Goldstein specifically refers to as 'triangular inertia,' or a 'spillover effect.' Owing to this spillover effect, South Korea would have stood to benefit from the cooperation that occurred between North Korea and the United States. But since the United States to have acted ambiguously towards the North, it remains to be unclear how much it was actually able to utilize this dynamic and relay a positive effect onto the region.

South Korea itself, however, was not a direct beneficiary of North Korea's reciprocity nor of an inverse response, even though itself had exhibited evidence of reciprocating against the North, albeit at the lowest possible level ($p < .10$). Thus, compared to the opportunities that were presented to the United States, this by way of North Korea's bilateral and triangular response, South Korea's role and influence seems to have been comparatively minimal and of little consequence to the overall dynamic.

Nonetheless from these set of findings, and in regards to this study's hypothesis, my main takeaway from this model is this: North Korea is not a bully and though it does not do so all the time or for all of its negotiating partners, North Korea is at the very least capable of reciprocal behavior. During the years 2001-2006, North Korea was somewhat willing to cooperate with the United States and modify its behavior as a result of its interactions with the US in spite of their outstanding disagreements. The United States, on the other hand, did not adhere to a policy of bilateral reciprocity towards North Korea during the first stable period, even though it had factored in significantly the actions of North Korea in shaping its response towards the regime. One possible explanation for this type of ambiguous response could be owing to the high levels of mistrust that was accorded to the North Korean regime during the Bush administration. Due to its bias of mistrust, Washington might not have viewed its cooperative gestures to be of an earnest and genuine nature. Or, alternatively, Washington could have simply missed or misread its signals altogether. Regardless of the reason, what is important is that North Korea's response patterns clearly indicate that the United States had at the very least an opportunity to improve its relations with the DPRK during the crisis' early years.

Based on the discoveries that have been earned in the first period of stability model, I had already earned enough evidence to make an initial assessment in regards to the status of my hypotheses. Hypotheses 2 and 4 I moved to reject because there was no evidence to support that North Korea had exhibited a pattern of an inverse response and because North Korea's triangular patterns were also revealed to have been positive. Hypotheses 1 and 3 I accepted because the North Korean variables had revealed strong evidence of reciprocation and no evidence of inverse response.

5.3 Second Period of Stability

Table 1.3

F-Test Results for Second Period of Stability

| Dependent Variable | Independent Variable | Chi-square | Significance | R-Squared |
|--------------------|----------------------|------------|--------------|-----------|
| UD | UD | 47.603379 | .0000*** | .313513 |
| | DU | .655346 | .4184 | |
| | RD | 2.639612 | .1046 | |
| | DR | .013617 | .9071 | |
| DU | UD | 4.493350 | .0343* | .153026 |
| | DU | .252110 | .6157 | |
| | RD | 7.760844 | .0053* | |
| | DR | .124639 | .7241 | |
| RD | UD | 10.095825 | .0015** | .280377 |
| | DU | .277117 | .5986 | |
| | RD | 8.830149 | .0030** | |
| | DR | 3.960199 | .0469* | |
| DR | UD | .969420 | .3248 | .130757 |
| | DU | 1.239756 | .2655 | |
| | RD | 8.519729 | .0035** | |
| | DR | 2.381001 | .1228 | |

*** = $p < .001$; ** = $p < .01$; * = $p < .05$; + = $p < .10$.

Note.— Model consists of weekly data observations numbered 303-506 ($n=205$).

In the second period model I observed several changes to have occurred. Mainly these changes consisted of positive trends that would have contributed in creating an environment that was more conducive for the enhancement of relations with the regime.

The first of these positive trends was an overall decrease in the number of actors that exhibited patterns of policy inertia. If we recall, during the first period I had detected three out of four variables, UD, DU, and RD to have exhibited patterns of policy inertia. In the second period, if we look to the estimates provided in table 1.3., the variable UD remained consistent in its high levels of policy inertia at

$p < .001$ and RD actually underwent an increase in its levels from $p < .10$ to $p < .01$, but the variable DU no longer exhibited any significant signs of policy inertia. From this it could be conjectured that North Korea perhaps grew to become more reactionary in its response towards the United States as the nuclear crisis progressed and happened to prolong.

During the second period there was also an increase in the number of coefficients that tested to be both significant and positive in terms of reciprocity. In the first period it had only been DU that had exhibited reciprocal signs while UD's estimates similarly had been significant yet ambiguous in its direction. In the second period DU continued to exhibit reciprocal patterns of behavior at $p < .05$, but it was also accompanied with variables RD and DR at $p < .05$ and $p < .01$ respectively. Hence reciprocal patterns had actually evolved despite, or perhaps owing to, the crisis' prolongation. Also it is worth noting that North Korea, in 2006-2010, had reciprocated towards both its partners, whereas the United States never did and South Korea only came to reciprocate it belatedly during the second half of the period. But there was still no indication that any of the actors involved had engaged in an inverse type of response.

Moving on we lastly look towards the trends that indicate triangular response where it appears that certain developments have added to South Korea's role and influence in the overall triad of relations. Namely, by referencing DU's positively directed and significant correlation with the explanatory variable RD, it seems that North Korea during the second period had increased its levels of cooperation with the United States whenever South Korea cooperation more with the regime. This combined with the fact that North Korea had behaved reciprocally towards South Korea tells us that relative to the first period South Korea has had more sway in determining North Korea's decisions when it came to itself as well as its ally.

Compare this result with how the United States had been the more influential actor during the first period.

An additional finding in regards to pattern of triangularity, we also find that South Korea now bases its cooperation levels with North Korea on the actions of the United States towards North Korea. This I compare with its patterns in the first period when South Korea had acted in a way that rewarded North Korea when it happened to cooperate more with the United States. Hence South Korea during the second period has been more reliant and imitative of United States North Korea policies relative to the first period when it rather was directly and actively involved in trying to induce North Korea's cooperation with the United States. Thus overall during the second period, South Korea had more of an opportunity to influence the dynamics of US-DPRK-ROK relations, but judging from its triangular patterns it is questionable whether or not it had actually been proactive in doing so as its actions were shown to be imitative of the United States.

6. Conclusion

Having concluded my analyses of the behavioral patterns for both periods, I am now able to decisively reject hypotheses numbers two and four. I also move to accept hypotheses numbers one and three because at the very least, within the scope of its relations with the United States and South Korea, North Korea has shown itself not to be a bully but in fact an engageable partner that has behaved reciprocally towards its bilateral partners. Specifically, three times out of four North Korea has exhibited reciprocative patterns during 2001-2010. Compare this record to the one of two times South Korea had reciprocated and zero out of two times for the United States. What is more, in two of these instances in which North Korea behaved reciprocally it was against the actions of another partner, the United States, which did not exhibit reciprocal patterns towards itself in return. Thus if we were limit our criteria on engageability on evidences of reciprocative behaviors alone, North Korea's engageability seems to far surpass those of its two partners, partners whom many times have expressed their skepticism towards the engageability of the former.

Another significant discovery happened to contradict an element contained within the common hardline perception regarding North Korea. That is that North Korea during this time period, apparently did not operate on a policy of conquer and divide in its relations with the US-ROK alliance. Rather estimates on triangularity for both periods suggests that North Korea's cooperating with one partner of the alliance was often accompanied by a subsequent chain reaction wherein North Korea chose to increase in its cooperation levels with the other partner. This I regard as being a far cry from being manipulative. If North Korea were to have truly attempted to cause deliberate fissures amongst its negotiating partners then the model would have produced evidences pointing towards patterns of triangular

inverse response much like how Davies had discovered North Korea to behave in its relations with the United States and China in years 1990-1994. But my empirical results indicate that North Korea's had been willing to cooperate with both the United States and South Korea together.

Thirdly, I note the few occurrences in which North Korea has tested negative on patterns of policy inertia. This I regard as being additional evidence that can be argued to be in favor of North Korea's engageability. Unlike the United States and South Korea which had both been consistent in their patterns of policy inertia, North Korea had only done so in one instance with the United States during the first period. During the second period, North Korea exhibited tested negative in both dyads. And though policy inertia was not an element to be included in my hypotheses for this study, a lesser degree of it would indicate that a country is more readily open towards by influenced by external factors as opposed to being immutable.

The United States, on the other hand, was evidenced to have been very set in its ways as its levels of inertia have remained constant and consistently strong throughout the entire decade. This could be a partially explanation for why there has been no detection of a reciprocal response from the United States during this period.

Relative to the United States, South Korea was indicated as being more open towards taking advantage of North Korea's gestures. Though it also showed signs of being constrained by influences of its own actions, South Korea at least showed evidence of reciprocating towards the regime in the second period. Also its influence over the larger dynamic of relations had considerably improved. But if it truly aspires in playing the role of a balancer in its trilateral relations with the

United States and North Korea it would arguably stand to accomplish a lot more if it were able to mobilize the efforts of the United States in tandem with its own.

Granted empirical data on North Korea's behavioral patterns can only present us with but a small fraction of a situation that is far more complex than can be fully understood using only statistical terms. But all in all, I view the past decade to have been a major missed opportunity for South Korea and especially the United States. Thus it is arguable that the first decade of the crisis would have fared much better than it had if North Korea's actions had been interpreted as presenting of a prime opportunity to extensively and collectively engage the regime.

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Appendix

Table 2
Weekly Time Series Data

| | DR | DU | RD | UD | | 30 | 0 | -16 | 0 | 13 |
|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----|-----|-----|----|
| 1 | 0 | 0 | 0 | 0 | 31 | 0 | -48 | 0 | 0 | 0 |
| 2 | 12 | 0 | 6 | 0 | 32 | 0 | 0 | 0 | 0 | 6 |
| 3 | 0 | 0 | 0 | 1 | 33 | 1 | 0 | 1 | 0 | 0 |
| 4 | 12 | 1 | 6 | 0 | 34 | 0 | 0 | 0 | 0 | 0 |
| 5 | 20 | 0 | 7 | 0 | 35 | 0 | -16 | 0 | 0 | 0 |
| 6 | 0 | 0 | 6 | 0 | 36 | 16 | 0 | 22 | 0 | 0 |
| 7 | -29 | 0 | 0 | 0 | 37 | 12 | -4 | 34 | 0 | 0 |
| 8 | -6 | -16 | -6 | 0 | 38 | 0 | -32 | 0 | 0 | 0 |
| 9 | 14 | -16 | 14 | -16 | 39 | 0 | 0 | 6 | 0 | 0 |
| 10 | 6 | 0 | 16 | -25 | 40 | -6 | -16 | -6 | 0 | 0 |
| 11 | 4 | -16 | 24 | 0 | 41 | -16 | -6 | 0 | 0 | 0 |
| 12 | 0 | -15 | 0 | -32 | 42 | 0 | 0 | 0 | -10 | 0 |
| 13 | -32 | -48 | 0 | -16 | 43 | 0 | -48 | 0 | -16 | 0 |
| 14 | 6 | -48 | 0 | 0 | 44 | -10 | 0 | 6 | 0 | 0 |
| 15 | 0 | -16 | 0 | -16 | 45 | -54 | -16 | -12 | -16 | 0 |
| 16 | -10 | 0 | 0 | 0 | 46 | -38 | 0 | 0 | -6 | 0 |
| 17 | 0 | -16 | 10 | 0 | 47 | 0 | 0 | -29 | -16 | 0 |
| 18 | 6 | -32 | 43 | -51 | 48 | -16 | -48 | -12 | -22 | 0 |
| 19 | -16 | -16 | 0 | 0 | 49 | 0 | -16 | 0 | 0 | 0 |
| 20 | 0 | -32 | 0 | 33 | 50 | 0 | -48 | 6 | 0 | 0 |
| 21 | 0 | 0 | -16 | 0 | 51 | 6 | 0 | 37 | 10 | 0 |
| 22 | -10 | 0 | 6 | 6 | 52 | 0 | -16 | 0 | 0 | 0 |
| 23 | 6 | -10 | 20 | 2 | 53 | 0 | 0 | 0 | 0 | 0 |
| 24 | 1 | 6 | 7 | 6 | 54 | 0 | -16 | 6 | -18 | 0 |
| 25 | 1 | -16 | 7 | -6 | 55 | 0 | 0 | 0 | -16 | 0 |
| 26 | 0 | 0 | 0 | -2 | 56 | 0 | -38 | 7 | -82 | 0 |
| 27 | 0 | -16 | 6 | 1 | 57 | 0 | -31 | 6 | -32 | 0 |
| 28 | 0 | -10 | 0 | 6 | 58 | -16 | -32 | 6 | -21 | 0 |
| 29 | 2 | -10 | 2 | 6 | 59 | 0 | -38 | 6 | -64 | 0 |

| | | | | | | | | | |
|-----------|-----|-----|-----|-----|------------|------|------|-----|-----|
| 60 | -16 | -16 | 40 | 27 | 95 | 14 | -21 | 14 | -22 |
| 61 | 0 | -16 | 0 | -48 | 96 | 6 | 0 | -18 | -54 |
| 62 | 0 | -48 | 0 | 0 | 97 | 0 | -6 | 0 | -29 |
| 63 | -16 | -16 | 0 | -16 | 98 | -30 | -61 | -30 | -45 |
| 64 | 6 | 6 | 7 | 0 | 99 | 14 | -16 | 14 | 0 |
| 65 | -16 | -10 | 14 | 12 | 100 | 0 | 0 | 0 | -45 |
| 66 | 6 | -16 | 6 | 0 | 101 | -10 | -96 | -12 | -47 |
| 67 | 0 | 0 | 0 | 0 | 102 | -6 | -60 | 6 | 1 |
| 68 | 0 | 0 | 0 | 0 | 103 | -77 | -60 | -22 | -86 |
| 69 | -10 | 6 | 6 | 6 | 104 | -45 | -67 | -6 | -15 |
| 70 | -16 | 0 | -6 | 0 | 105 | 10 | -22 | -12 | 5 |
| 71 | 6 | 0 | 33 | 0 | 106 | -13 | -80 | -4 | -42 |
| 72 | 0 | 0 | 0 | -48 | 107 | 0 | -31 | -6 | 8 |
| 73 | 0 | 0 | 0 | -16 | 108 | 6 | -32 | 7 | -18 |
| 74 | 0 | 0 | -6 | 0 | 109 | 10 | -54 | 20 | -32 |
| 75 | 0 | -4 | 6 | 2 | 110 | -15 | -93 | 20 | -48 |
| 76 | 0 | 0 | 0 | 27 | 111 | 12 | -44 | 8 | -83 |
| 77 | -71 | 0 | -48 | -10 | 112 | -60 | -54 | -16 | -12 |
| 78 | -9 | -16 | -16 | -16 | 113 | -118 | -249 | -8 | -7 |
| 79 | -32 | 0 | -16 | 0 | 114 | -32 | -108 | -6 | -67 |
| 80 | 27 | 0 | 28 | 0 | 115 | 0 | -44 | -6 | -57 |
| 81 | 12 | 6 | 0 | 0 | 116 | -55 | -96 | -35 | 21 |
| 82 | -10 | 18 | 0 | 6 | 117 | 0 | -67 | -6 | -35 |
| 83 | 6 | 0 | 6 | -6 | 118 | -60 | -92 | -12 | -64 |
| 84 | -4 | -32 | 12 | 0 | 119 | -6 | -58 | -28 | -16 |
| 85 | 0 | 0 | 0 | -29 | 120 | -23 | -23 | -6 | 6 |
| 86 | 27 | 0 | 27 | -6 | 121 | -19 | -48 | 6 | 0 |
| 87 | 14 | 0 | 14 | 6 | 122 | -12 | -21 | -6 | -16 |
| 88 | 6 | 0 | 0 | 0 | 123 | 0 | -16 | 0 | -16 |
| 89 | 0 | 10 | 0 | 0 | 124 | -23 | -45 | -26 | -16 |
| 90 | 14 | 0 | 0 | 6 | 125 | -10 | -22 | 1 | -38 |
| 91 | 0 | 0 | 0 | 6 | 126 | -60 | 6 | -22 | -39 |
| 92 | 0 | -16 | 0 | -16 | 127 | -16 | -10 | -21 | -50 |
| 93 | 0 | -45 | 15 | -22 | 128 | 11 | -32 | 11 | -22 |
| 94 | 12 | -9 | 0 | -12 | 129 | -16 | -64 | 0 | -12 |

| | | | | | | | | | |
|------------|-----|------|-----|-----|------------|-----|-----|-----|-----|
| 130 | 14 | -16 | 8 | -12 | 165 | 0 | -10 | 0 | -28 |
| 131 | 17 | -10 | 33 | -29 | 166 | 30 | -4 | -4 | 14 |
| 132 | 12 | 1 | -3 | -16 | 167 | 6 | -32 | 6 | -10 |
| 133 | -73 | -39 | 1 | 1 | 168 | -6 | -28 | -16 | 0 |
| 134 | 0 | -48 | 1 | -51 | 169 | -63 | -96 | -35 | 0 |
| 135 | 14 | -26 | 20 | -4 | 170 | 0 | -16 | 0 | 0 |
| 136 | 0 | -22 | 0 | 6 | 171 | 0 | 0 | 0 | -16 |
| 137 | 0 | -16 | 0 | -12 | 172 | 0 | 0 | 0 | 0 |
| 138 | 28 | -16 | 27 | -6 | 173 | 0 | 0 | 0 | -27 |
| 139 | -86 | -41 | 6 | 6 | 174 | 6 | 0 | 0 | -6 |
| 140 | -15 | -15 | -32 | 0 | 175 | 6 | -26 | 87 | 18 |
| 141 | -29 | -64 | 0 | -35 | 176 | -10 | 0 | 33 | 0 |
| 142 | 28 | -16 | 28 | -51 | 177 | 12 | -31 | 6 | -10 |
| 143 | 0 | -16 | 0 | -41 | 178 | -6 | -16 | 0 | 0 |
| 144 | -74 | -106 | -12 | -6 | 179 | 6 | 0 | 6 | 0 |
| 145 | 0 | 0 | 0 | 0 | 180 | 6 | -16 | 6 | -22 |
| 146 | -32 | -38 | 21 | 0 | 181 | 0 | 0 | 0 | 0 |
| 147 | 1 | -4 | 1 | -12 | 182 | 27 | -16 | 0 | -16 |
| 148 | -44 | -32 | 1 | -12 | 183 | -6 | -26 | 6 | 13 |
| 149 | 12 | -45 | 12 | 0 | 184 | 0 | -3 | 0 | -39 |
| 150 | 0 | -16 | 0 | 0 | 185 | -23 | -29 | 0 | 0 |
| 151 | 0 | -9 | -29 | -29 | 186 | 0 | 0 | 0 | -6 |
| 152 | -45 | 0 | 0 | 0 | 187 | -66 | 0 | -10 | 27 |
| 153 | 0 | -38 | -29 | 0 | 188 | -16 | -16 | 0 | 0 |
| 154 | 0 | -5 | 7 | 7 | 189 | 0 | 0 | 0 | 1 |
| 155 | 0 | -48 | 0 | -27 | 190 | 14 | 6 | 20 | 6 |
| 156 | 6 | -10 | 0 | 27 | 191 | -32 | -32 | 0 | 0 |
| 157 | 0 | -16 | 0 | 0 | 192 | 0 | -16 | 0 | -32 |
| 158 | 0 | 6 | 0 | 0 | 193 | -32 | -32 | 0 | 0 |
| 159 | 6 | 0 | 0 | 12 | 194 | -32 | -32 | 0 | 0 |
| 160 | 0 | -16 | 6 | 0 | 195 | -22 | -38 | 0 | -15 |
| 161 | 0 | 1 | 0 | -16 | 196 | -16 | -16 | 0 | -6 |
| 162 | 0 | 1 | 1 | -6 | 197 | -16 | -51 | 0 | -51 |
| 163 | -4 | -15 | -10 | 1 | 198 | 6 | -32 | 8 | 0 |
| 164 | 0 | -16 | 0 | -34 | 199 | 6 | -10 | 0 | 0 |

| | | | | | | | | | |
|------------|-----|-----|-----|------|------------|-----|-----|-----|------|
| 200 | -16 | -64 | 0 | -51 | 235 | 12 | 6 | 6 | -18 |
| 201 | 0 | -16 | -29 | -93 | 236 | 12 | -10 | -4 | 11 |
| 202 | -60 | -16 | 0 | 0 | 237 | 6 | -6 | 6 | -23 |
| 203 | 0 | -6 | -16 | 0 | 238 | 10 | 22 | 0 | 12 |
| 204 | 0 | -10 | 0 | 0 | 239 | 16 | 16 | 24 | -6 |
| 205 | 0 | -16 | 0 | 0 | 240 | 0 | -28 | 0 | -6 |
| 206 | -45 | -28 | 0 | 12 | 241 | 6 | 18 | 6 | 18 |
| 207 | 0 | 6 | 0 | -6 | 242 | 0 | 0 | 0 | 0 |
| 208 | 0 | -32 | 0 | 6 | 243 | -22 | -28 | 4 | -12 |
| 209 | 6 | -16 | 0 | 0 | 244 | 14 | 6 | 14 | 0 |
| 210 | -16 | -32 | 0 | 0 | 245 | 8 | -10 | 8 | 6 |
| 211 | 0 | 0 | 0 | 0 | 246 | -38 | -32 | -6 | -25 |
| 212 | 0 | -42 | 0 | 6 | 247 | 6 | 0 | 6 | 6 |
| 213 | -6 | -4 | 0 | 6 | 248 | 18 | -10 | 24 | -22 |
| 214 | 0 | -16 | 0 | -16 | 249 | -16 | -48 | 0 | -33 |
| 215 | 0 | 0 | 6 | 0 | 250 | 0 | -16 | 0 | 0 |
| 216 | -16 | -16 | 0 | 6 | 251 | 0 | -16 | 0 | 0 |
| 217 | -32 | -80 | 0 | -16 | 252 | 0 | -16 | 0 | -16 |
| 218 | 0 | -32 | -47 | -84 | 253 | -10 | -4 | 1 | -22 |
| 219 | -6 | -6 | -28 | -10 | 254 | 0 | -16 | 0 | -16 |
| 220 | 0 | -9 | -6 | -28 | 255 | 20 | -16 | 20 | -16 |
| 221 | 6 | 6 | 0 | 0 | 256 | 12 | -20 | 6 | -58 |
| 222 | -16 | -96 | 0 | -62 | 257 | 0 | 0 | -16 | -110 |
| 223 | -32 | -32 | 0 | -22 | 258 | 0 | -16 | -29 | -29 |
| 224 | 0 | -38 | 0 | -18 | 259 | 6 | 6 | 0 | -51 |
| 225 | 0 | -16 | 0 | -22 | 260 | 0 | -48 | 6 | -44 |
| 226 | 0 | -32 | 1 | 6 | 261 | 0 | -32 | 6 | -16 |
| 227 | 12 | -26 | 12 | 0 | 262 | 6 | -16 | 6 | 0 |
| 228 | 0 | -32 | -38 | -55 | 263 | 0 | -32 | 0 | -16 |
| 229 | 0 | 0 | -5 | -38 | 264 | 0 | -32 | 0 | -12 |
| 230 | -23 | -93 | 0 | -16 | 265 | 0 | -6 | 0 | 6 |
| 231 | 0 | 6 | 17 | -10 | 266 | 12 | 18 | -6 | 0 |
| 232 | 18 | -54 | 18 | -48 | 267 | 0 | -16 | -23 | -6 |
| 233 | 6 | -76 | 6 | -112 | 268 | 18 | -16 | 18 | -54 |
| 234 | -16 | -4 | 0 | 0 | 269 | 6 | 0 | 0 | 0 |

| | | | | | | | | | |
|------------|-----|-----|-----|------|------------|-----|-----|-----|------|
| 270 | 0 | -32 | 0 | -10 | 305 | 0 | -58 | -73 | -104 |
| 271 | 0 | 0 | 0 | -16 | 306 | -16 | -16 | -35 | -60 |
| 272 | 4 | -6 | 0 | 0 | 307 | -20 | -20 | 6 | 1 |
| 273 | -16 | -22 | 0 | -32 | 308 | 0 | 0 | -12 | -12 |
| 274 | 0 | -32 | 14 | -22 | 309 | -16 | -16 | -16 | -64 |
| 275 | 0 | -32 | 0 | -6 | 310 | 0 | 0 | -16 | -32 |
| 276 | 0 | -48 | 0 | -35 | 311 | 26 | 0 | 26 | -29 |
| 277 | 16 | -16 | 12 | -12 | 312 | 0 | 6 | -10 | -23 |
| 278 | 0 | -16 | 0 | 0 | 313 | 0 | 0 | 6 | 12 |
| 279 | 6 | -16 | 16 | -6 | 314 | -6 | -58 | -6 | -22 |
| 280 | 0 | 0 | 0 | -96 | 315 | 0 | 0 | -16 | -6 |
| 281 | 0 | 0 | 0 | -16 | 316 | 0 | -16 | 0 | -6 |
| 282 | 0 | 0 | 10 | 0 | 317 | 6 | 12 | -6 | 6 |
| 283 | 0 | 0 | -6 | 0 | 318 | 0 | 6 | -6 | 12 |
| 284 | -10 | 0 | -6 | 0 | 319 | 6 | 12 | 18 | 6 |
| 285 | -16 | 6 | -29 | -76 | 320 | 0 | -10 | 0 | -10 |
| 286 | 0 | -16 | -6 | 0 | 321 | 12 | 38 | 6 | 21 |
| 287 | 12 | 0 | -10 | -38 | 322 | 12 | -16 | 6 | -6 |
| 288 | 20 | -70 | -12 | -120 | 323 | 0 | -16 | 0 | 6 |
| 289 | 6 | -42 | 6 | -28 | 324 | 6 | 0 | -6 | -32 |
| 290 | -32 | -64 | -51 | -145 | 325 | 10 | 0 | 10 | 10 |
| 291 | -16 | -32 | -51 | -57 | 326 | -6 | -16 | -6 | 20 |
| 292 | -16 | 0 | -22 | -64 | 327 | -12 | -28 | 31 | 0 |
| 293 | 6 | -38 | 0 | -26 | 328 | 0 | 0 | 60 | 0 |
| 294 | -50 | 0 | 10 | -29 | 329 | 6 | 0 | 6 | 0 |
| 295 | 6 | 0 | 27 | 0 | 330 | 10 | 16 | 4 | -24 |
| 296 | 0 | 0 | 6 | -22 | 331 | -16 | 0 | -18 | -2 |
| 297 | -45 | -32 | -31 | 0 | 332 | 10 | 0 | 10 | -12 |
| 298 | 0 | -16 | 27 | -45 | 333 | 33 | 0 | 33 | -6 |
| 299 | 0 | 0 | 0 | -22 | 334 | 27 | 6 | 27 | -6 |
| 300 | 0 | -16 | 0 | -48 | 335 | 27 | 0 | 27 | 0 |
| 301 | 0 | 0 | -6 | -10 | 336 | -32 | -16 | -12 | 0 |
| 302 | 0 | -32 | -6 | -23 | 337 | -32 | -6 | -2 | 6 |
| 303 | -48 | -16 | -60 | -179 | 338 | 6 | 0 | 6 | -16 |
| 304 | 0 | -74 | -48 | -252 | 339 | 27 | 11 | 26 | -6 |

| | | | | | | | | | |
|------------|-----|-----|----|-----|------------|-----|-----|-----|-----|
| 340 | 31 | 37 | 10 | 24 | 375 | 0 | -16 | -16 | 0 |
| 341 | 6 | 0 | 43 | -6 | 376 | -6 | 6 | 33 | 6 |
| 342 | 6 | 0 | 0 | -6 | 377 | 0 | 20 | -6 | 2 |
| 343 | 0 | -10 | 27 | 16 | 378 | -10 | -64 | -10 | -6 |
| 344 | -11 | 0 | 20 | 10 | 379 | 0 | 6 | -10 | -28 |
| 345 | -32 | 0 | -6 | 0 | 380 | 0 | -10 | -35 | 0 |
| 346 | 10 | 10 | 0 | 0 | 381 | -90 | -48 | -75 | -22 |
| 347 | -54 | -26 | 12 | 10 | 382 | -70 | -16 | -12 | 0 |
| 348 | 6 | 18 | 36 | 22 | 383 | -16 | -16 | 0 | 6 |
| 349 | -6 | -16 | 37 | -16 | 384 | 0 | 0 | 4 | -12 |
| 350 | 0 | 16 | 0 | -6 | 385 | -45 | 6 | 0 | -28 |
| 351 | 31 | 37 | 0 | 0 | 386 | 6 | 6 | 0 | 0 |
| 352 | 0 | 14 | 27 | 6 | 387 | 0 | 26 | 0 | 12 |
| 353 | 0 | -22 | 0 | -6 | 388 | 0 | 10 | 6 | 10 |
| 354 | 6 | 6 | 6 | 10 | 389 | -16 | 0 | 6 | 0 |
| 355 | 58 | 31 | 57 | 6 | 390 | 0 | -10 | 0 | -10 |
| 356 | 0 | -16 | 0 | 0 | 391 | 0 | 0 | 20 | 0 |
| 357 | 0 | 0 | 10 | 6 | 392 | -16 | -10 | 6 | 12 |
| 358 | -16 | 0 | -6 | 0 | 393 | 0 | 0 | 6 | -6 |
| 359 | 6 | 20 | 6 | 37 | 394 | 24 | 54 | 0 | 30 |
| 360 | 27 | 10 | 11 | -6 | 395 | -6 | -6 | 6 | 37 |
| 361 | 27 | 0 | 37 | 0 | 396 | -54 | 6 | -7 | 6 |
| 362 | 27 | 6 | 37 | 6 | 397 | -22 | 0 | 6 | 0 |
| 363 | 18 | 0 | 12 | 0 | 398 | -20 | 12 | 6 | 2 |
| 364 | 0 | 14 | 37 | 18 | 399 | 0 | 0 | 0 | 0 |
| 365 | 32 | 10 | 31 | 0 | 400 | -51 | -6 | -6 | 21 |
| 366 | 27 | 14 | 54 | 0 | 401 | 0 | 6 | -6 | 0 |
| 367 | -16 | -16 | 0 | 0 | 402 | 0 | -54 | 0 | 0 |
| 368 | 0 | 0 | -6 | -6 | 403 | -45 | -45 | 0 | -6 |
| 369 | 6 | -32 | 12 | -18 | 404 | -16 | 0 | -16 | 6 |
| 370 | 0 | 0 | 0 | 6 | 405 | 0 | -16 | 0 | -16 |
| 371 | 0 | -16 | 6 | 0 | 406 | 0 | -16 | 0 | -6 |
| 372 | 6 | -22 | 6 | -6 | 407 | -10 | -16 | -6 | -22 |
| 373 | 6 | -10 | 0 | 0 | 408 | -10 | 12 | 6 | 18 |
| 374 | -32 | -48 | 0 | -6 | 409 | -16 | 6 | -22 | -12 |

| | | | | | | | | | |
|------------|-----|-----|-----|------|------------|------|-----|-----|-----|
| 410 | -16 | 0 | 0 | 0 | 445 | -6 | -32 | -44 | -47 |
| 411 | -38 | 0 | 6 | 0 | 446 | -32 | -32 | 0 | -16 |
| 412 | -16 | 0 | 6 | 0 | 447 | 6 | -16 | -10 | -44 |
| 413 | 0 | 12 | -16 | 6 | 448 | -16 | 0 | -6 | -6 |
| 414 | -70 | -6 | -12 | 27 | 449 | -16 | -16 | 0 | -38 |
| 415 | -16 | 0 | 0 | -6 | 450 | -16 | -26 | 0 | -27 |
| 416 | -16 | 0 | 0 | 0 | 451 | -67 | -10 | -6 | -35 |
| 417 | -74 | 12 | -6 | 12 | 452 | 6 | 16 | 0 | 6 |
| 418 | -22 | -22 | -22 | -28 | 453 | 8 | 0 | 16 | -23 |
| 419 | -16 | 0 | -6 | 0 | 454 | 0 | -16 | 28 | 6 |
| 420 | -16 | -16 | 0 | 0 | 455 | 34 | 6 | 33 | -6 |
| 421 | -16 | 0 | 0 | 6 | 456 | 10 | -6 | -6 | 0 |
| 422 | 0 | 0 | 0 | -16 | 457 | -16 | 0 | -38 | -38 |
| 423 | -2 | -42 | 0 | -18 | 458 | 7 | 6 | -22 | 6 |
| 424 | -22 | -9 | -6 | -6 | 459 | 20 | 0 | 8 | -28 |
| 425 | -61 | 0 | 0 | 0 | 460 | -15 | 6 | -16 | 6 |
| 426 | -16 | 6 | 0 | -35 | 461 | 7 | 6 | -44 | 0 |
| 427 | -16 | -16 | -21 | -11 | 462 | -22 | 0 | -10 | -6 |
| 428 | -64 | -42 | -54 | -44 | 463 | -6 | 6 | 11 | -61 |
| 429 | -16 | -16 | -6 | 0 | 464 | -6 | 6 | 10 | 6 |
| 430 | -80 | -68 | -21 | -12 | 465 | -6 | -32 | -6 | -15 |
| 431 | -42 | -48 | 0 | -6 | 466 | -113 | 0 | -81 | -6 |
| 432 | 20 | -35 | -32 | -28 | 467 | 6 | 0 | 6 | -16 |
| 433 | 0 | -6 | -32 | -32 | 468 | 0 | 0 | 6 | 0 |
| 434 | -51 | -64 | -38 | -75 | 469 | 0 | 0 | 0 | 0 |
| 435 | 0 | -16 | -32 | -64 | 470 | 6 | 12 | 10 | -31 |
| 436 | -39 | -58 | 0 | -34 | 471 | -16 | -16 | 21 | -12 |
| 437 | -6 | 0 | -18 | 6 | 472 | -16 | 0 | -16 | 0 |
| 438 | 0 | 0 | -16 | -32 | 473 | 0 | -29 | 0 | 0 |
| 439 | -16 | -32 | 0 | -16 | 474 | 12 | 1 | 0 | 0 |
| 440 | -29 | -16 | -16 | 0 | 475 | 0 | 0 | 0 | 0 |
| 441 | 0 | 0 | 6 | 0 | 476 | -31 | 15 | -22 | -28 |
| 442 | -16 | -16 | -48 | -88 | 477 | -3 | -15 | -10 | 0 |
| 443 | -60 | 0 | -44 | -60 | 478 | -145 | -29 | 6 | -48 |
| 444 | -16 | -32 | -89 | -120 | 479 | -23 | 10 | 0 | -6 |

| | | | | | | | | | |
|------------|------|-----|------|-----|------------|-----|-----|-----|-----|
| 480 | -6 | 6 | -6 | -12 | 515 | -16 | -48 | 6 | 0 |
| 481 | -29 | -32 | 0 | 0 | 516 | 0 | 0 | -16 | -16 |
| 482 | -45 | -16 | 0 | -6 | 517 | -2 | 6 | 35 | 6 |
| 483 | -16 | -16 | 8 | 0 | 518 | -16 | -16 | 6 | 0 |
| 484 | 1 | -31 | -6 | 0 | 519 | 1 | 1 | 0 | -16 |
| 485 | 0 | 0 | 0 | 0 | 520 | 6 | 0 | -38 | -45 |
| 486 | -16 | -16 | 0 | 0 | 521 | -98 | -32 | -50 | -90 |
| 487 | -45 | -16 | -58 | 0 | 522 | -16 | 0 | -16 | -28 |
| 488 | -38 | -48 | -6 | -22 | 523 | -48 | -10 | -43 | -40 |
| 489 | -32 | 0 | 0 | -16 | 524 | -16 | -10 | -12 | 6 |
| 490 | -29 | -16 | -64 | -6 | 525 | -16 | 0 | -16 | -6 |
| 491 | 0 | 0 | 0 | -22 | 526 | 6 | 0 | -16 | 0 |
| 492 | 0 | 0 | -6 | 0 | | | | | |
| 493 | 0 | 0 | 0 | -16 | | | | | |
| 494 | -104 | -32 | -64 | -38 | | | | | |
| 495 | -224 | -48 | -148 | -86 | | | | | |
| 496 | -48 | -48 | -89 | -50 | | | | | |
| 497 | -48 | 0 | 6 | 0 | | | | | |
| 498 | -54 | -16 | -54 | -54 | | | | | |
| 499 | -29 | -32 | -26 | -44 | | | | | |
| 500 | -5 | -16 | 0 | -32 | | | | | |
| 501 | -21 | -10 | -12 | -12 | | | | | |
| 502 | -16 | 6 | -6 | 0 | | | | | |
| 503 | -16 | -26 | -10 | -38 | | | | | |
| 504 | 0 | -6 | 0 | -16 | | | | | |
| 505 | -22 | -6 | 0 | -57 | | | | | |
| 506 | -110 | 0 | -16 | -16 | | | | | |
| 507 | -42 | -38 | -25 | -12 | | | | | |
| 508 | -16 | 16 | -6 | 6 | | | | | |
| 509 | -32 | -16 | 0 | -35 | | | | | |
| 510 | 16 | 0 | 0 | -6 | | | | | |
| 511 | 6 | 6 | 16 | -9 | | | | | |
| 512 | 6 | 0 | 6 | -6 | | | | | |
| 513 | 2 | -16 | -4 | 1 | | | | | |
| 514 | 0 | -16 | -6 | -12 | | | | | |

Table 3.1

Lag test results for entire period

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|-----|-----------|-----------|-----------|-----------|-----------|-----------|
| 0 | -9352.962 | NA | 5.75E+10 | 36.12727 | 36.16008 | 36.14012 |
| 1 | -9244.801 | 214.2335 | 4.03E+10 | 35.77143 | 35.93552* | 35.83572* |
| 2 | -9221.849 | 45.10656 | 3.92E+10 | 35.74459 | 36.03996 | 35.86032 |
| 3 | -9200.609 | 41.41451* | 3.85e+10* | 35.72436* | 36.151 | 35.89152 |
| 4 | -9191.835 | 16.97113 | 3.96E+10 | 35.75226 | 36.31017 | 35.97085 |
| 5 | -9179.839 | 23.01887 | 4.02E+10 | 35.76772 | 36.4569 | 36.03774 |
| 6 | -9172.351 | 14.25317 | 4.15E+10 | 35.80058 | 36.62104 | 36.12204 |
| 7 | -9163.265 | 17.15555 | 4.26E+10 | 35.82728 | 36.77901 | 36.20017 |
| 8 | -9152.647 | 19.88266 | 4.36E+10 | 35.84806 | 36.93106 | 36.27238 |

Note.— Accounting for entire data set, 526 weeks.

Table 3.2

Lag test results for first period of stability

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|-----|-----------|-----------|-----------|-----------|-----------|-----------|
| 0 | -5165.586 | NA | 2.20E+10 | 35.16725 | 35.21737* | 35.18732 |
| 1 | -5135.195 | 59.74849 | 2.00E+10 | 35.06935 | 35.31994 | 35.16971* |
| 2 | -5118.803 | 31.77991 | 1.99E+10 | 35.06669 | 35.51774 | 35.24732 |
| 3 | -5098.716 | 38.39863* | 1.94e+10* | 35.03888* | 35.6904 | 35.2998 |
| 4 | -5094.339 | 8.246973 | 2.10E+10 | 35.11795 | 35.96994 | 35.45915 |
| 5 | -5087.386 | 12.913 | 2.23E+10 | 35.1795 | 36.23195 | 35.60097 |
| 6 | -5081.61 | 10.56901 | 2.39E+10 | 35.24905 | 36.50197 | 35.75081 |
| 7 | -5073.284 | 15.00956 | 2.53E+10 | 35.30125 | 36.75464 | 35.88329 |
| 8 | -5060.896 | 21.99543 | 2.59E+10 | 35.32582 | 36.97968 | 35.98814 |

Note.— Accounting for weeks 1-302 out of 526.

Table 3.3

Lag test results for second period of stability

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|-----|-----------|-----------|-----------|-----------|-----------|-----------|
| 0 | -3716.264 | NA | 8.13E+10 | 36.47318 | 36.53824 | 36.49949 |
| 1 | -3653.47 | 122.5094* | 5.14e+10* | 36.01441* | 36.33972* | 36.14601* |
| 2 | -3646.447 | 13.42638 | 5.61E+10 | 36.10242 | 36.68797 | 36.33929 |
| 3 | -3637.908 | 15.99078 | 6.04E+10 | 36.17556 | 37.02136 | 36.5177 |
| 4 | -3630.631 | 13.34056 | 6.59E+10 | 36.26109 | 37.36713 | 36.7085 |
| 5 | -3619.55 | 19.88006 | 6.92E+10 | 36.30932 | 37.6756 | 36.862 |
| 6 | -3610.284 | 16.26208 | 7.41E+10 | 36.37533 | 38.00186 | 37.03329 |
| 7 | -3602.826 | 12.79485 | 8.08E+10 | 36.45908 | 38.34585 | 37.22231 |
| 8 | -3592.217 | 17.78584 | 8.55E+10 | 36.51193 | 38.65895 | 37.38044 |

Note.— Accounting for weeks 303-506 out of 526.

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

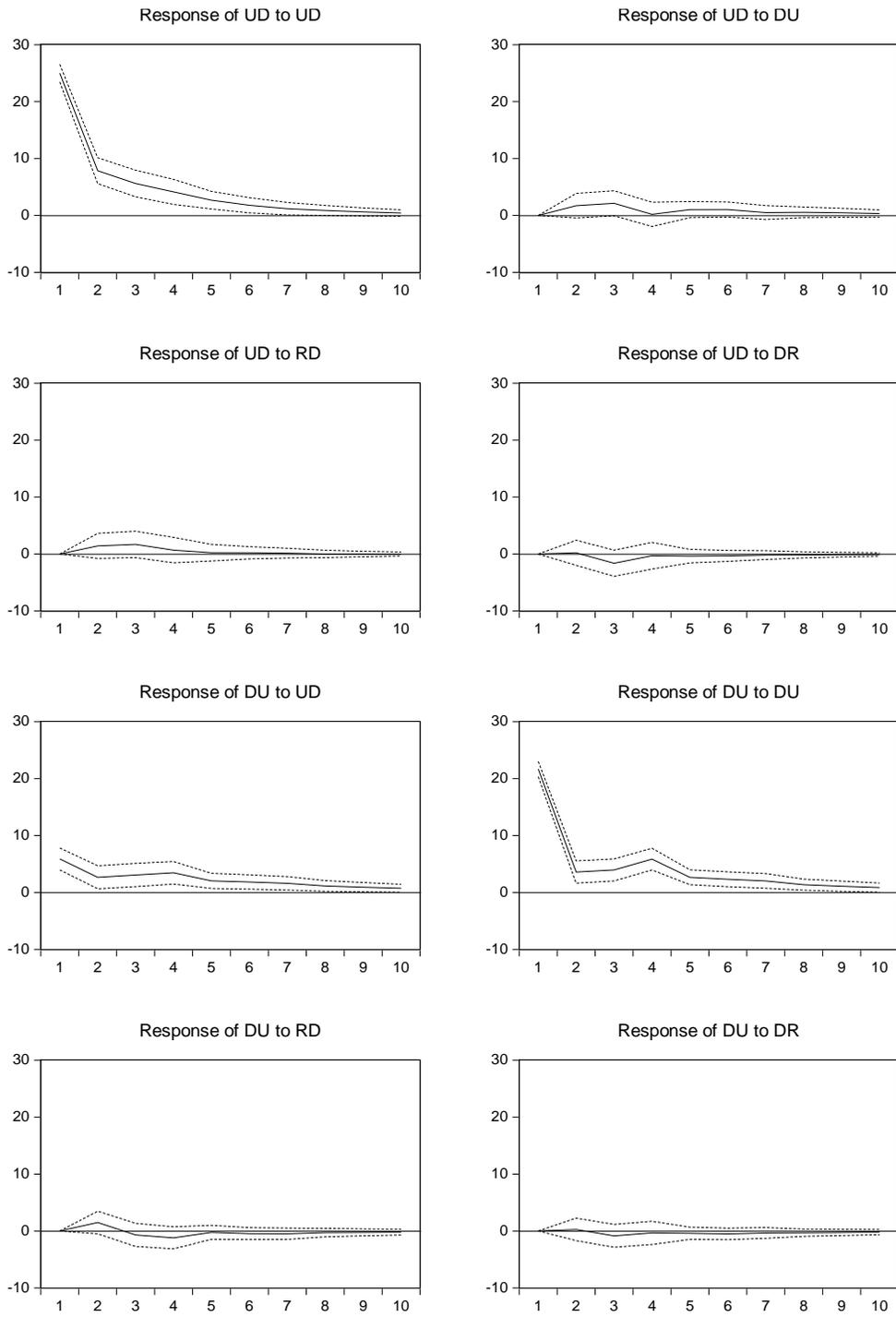


Figure 2.1 Impulse Responses for Entire Period

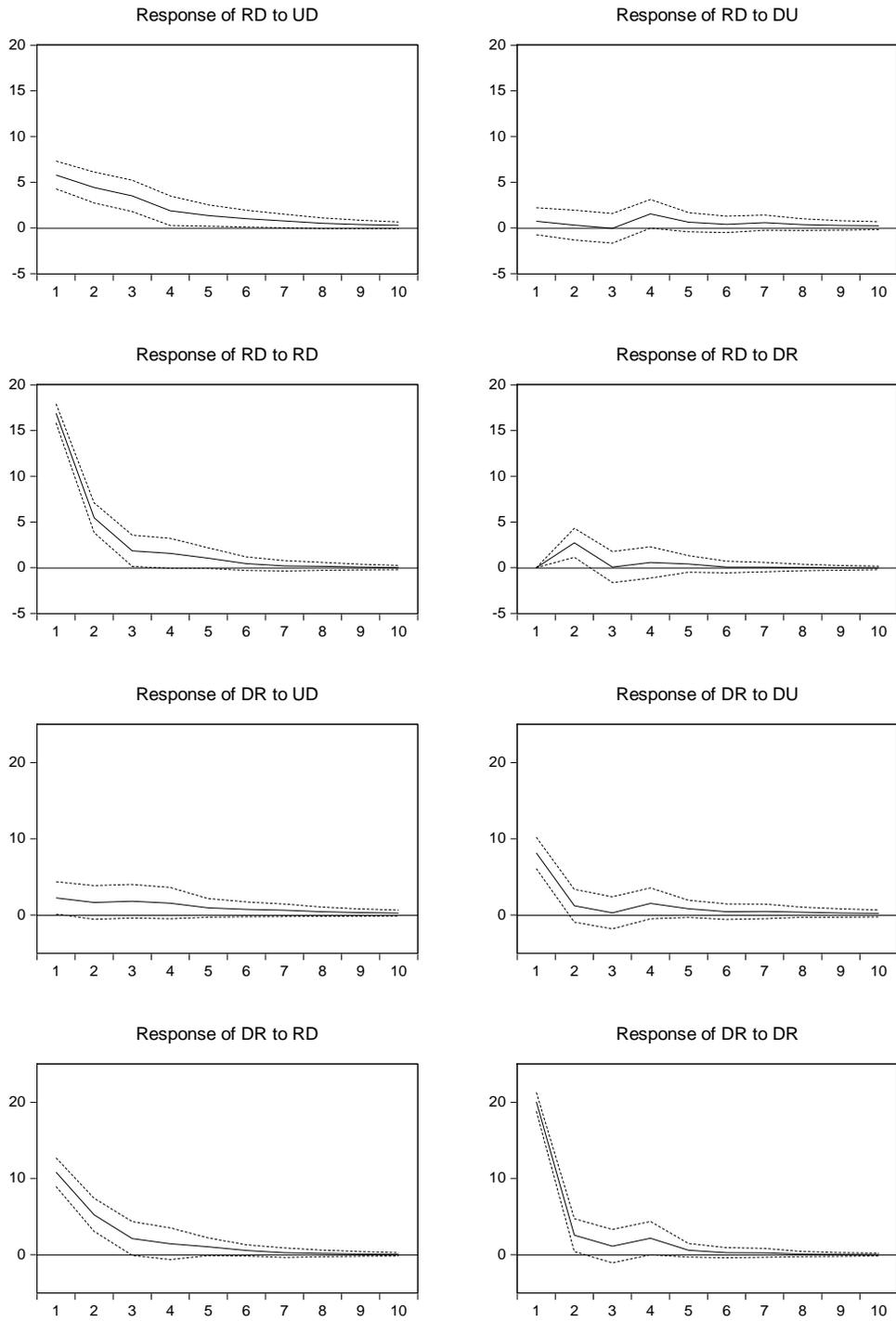


Figure 2.1 Impulse Responses for Entire Period (cont.)

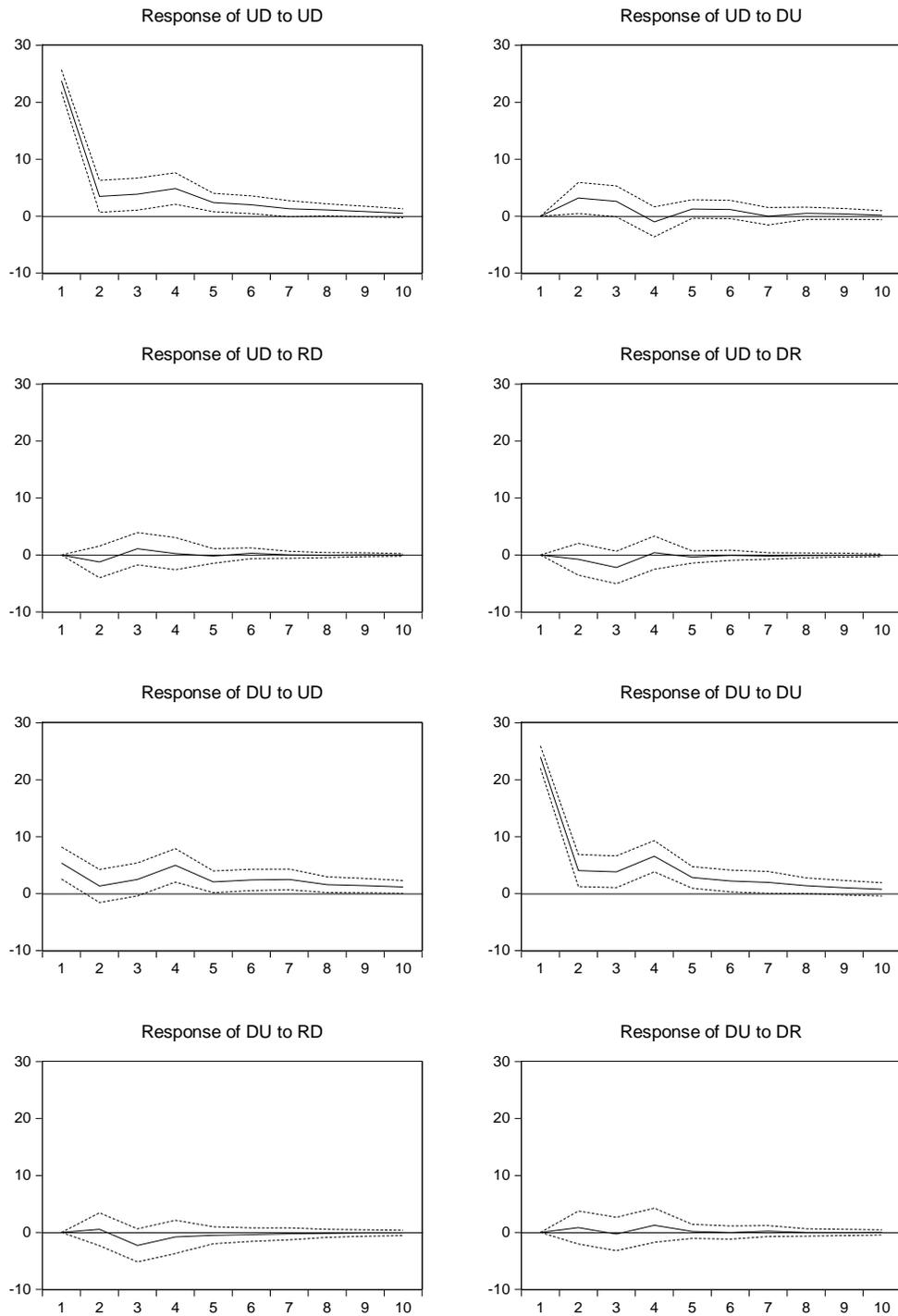


Figure 2.2 Impulse Responses for First Period

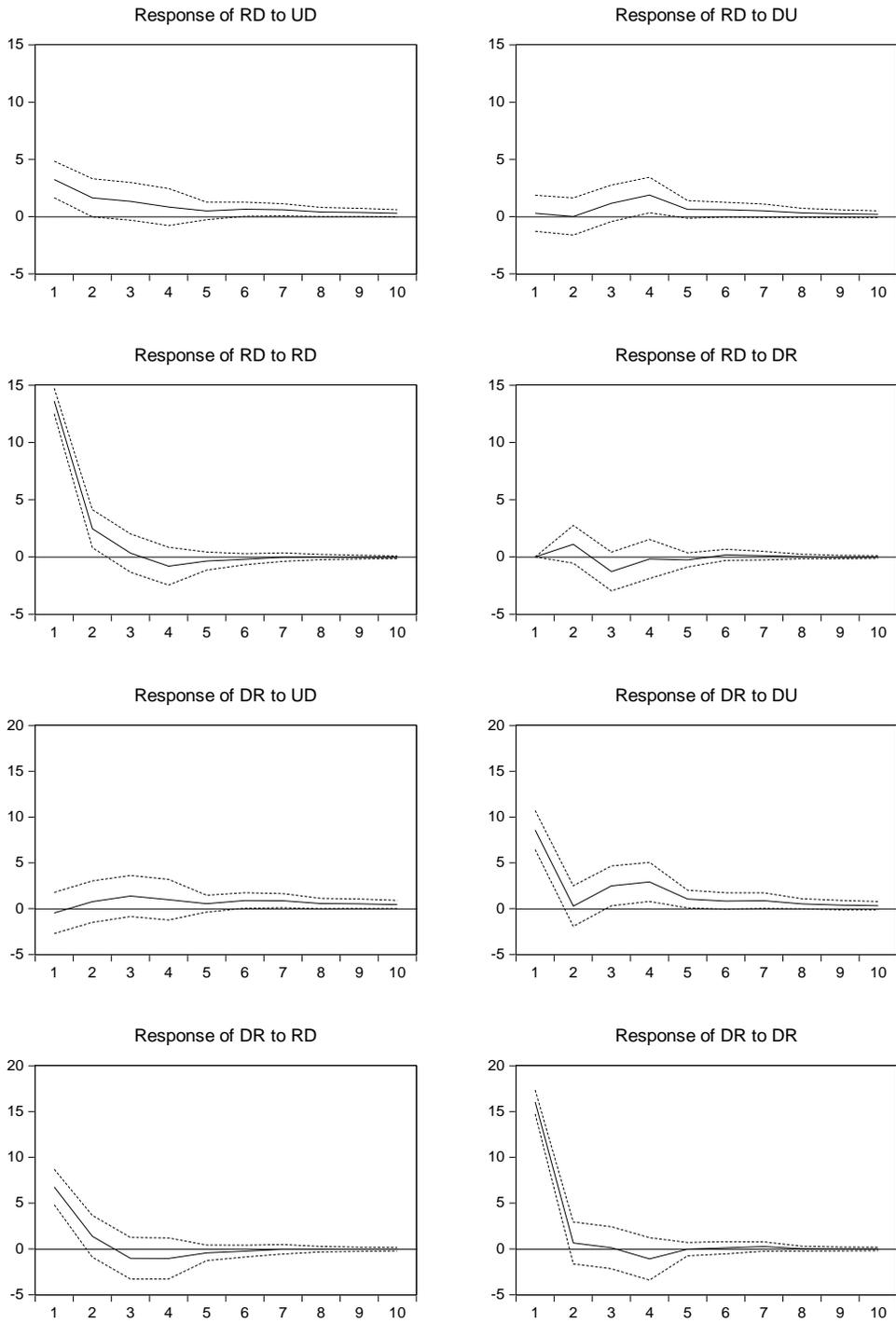


Figure 2.2 Impulse Responses for First Period (cont.)

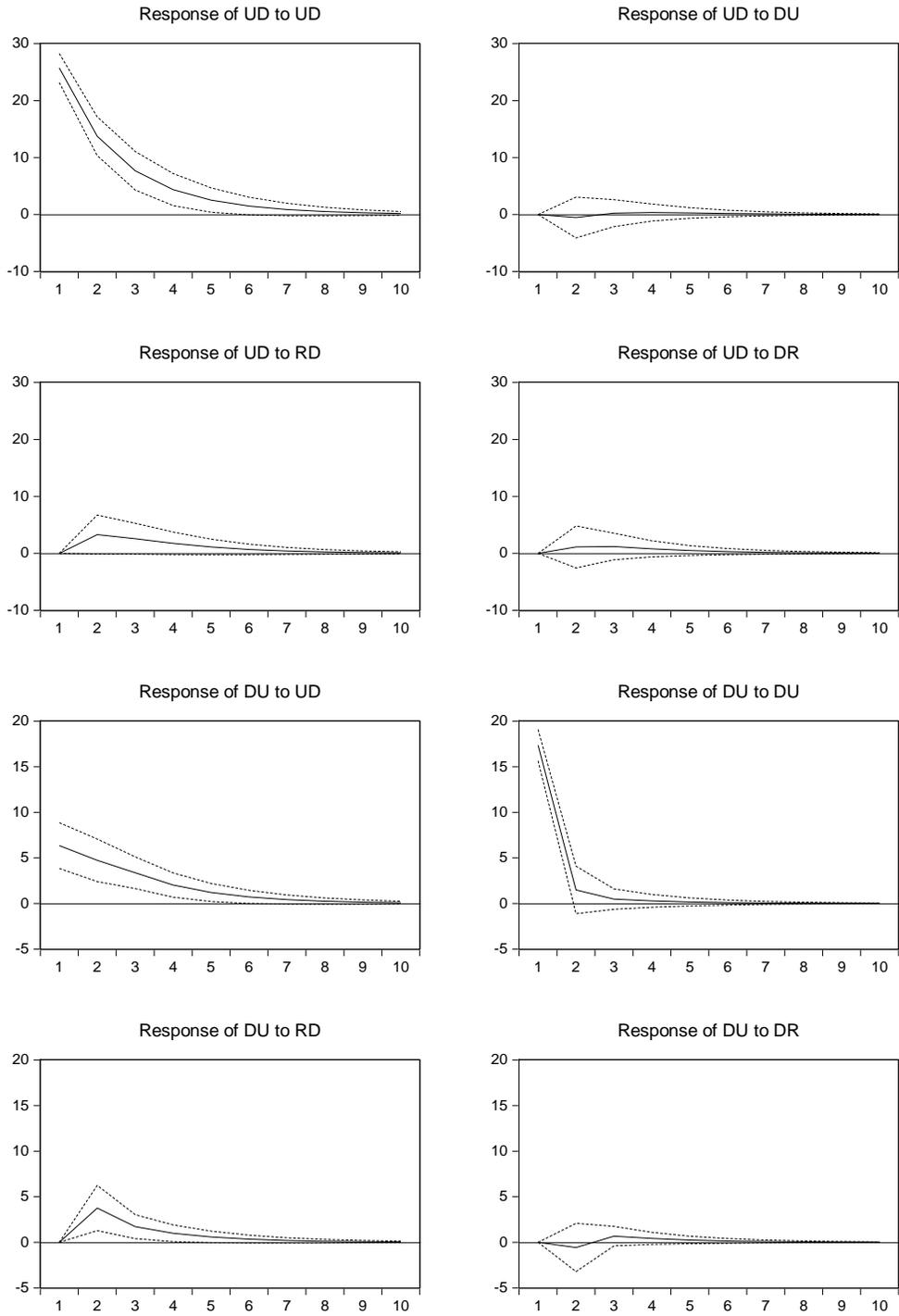


Figure 2.3 Impulse Responses for Second Period

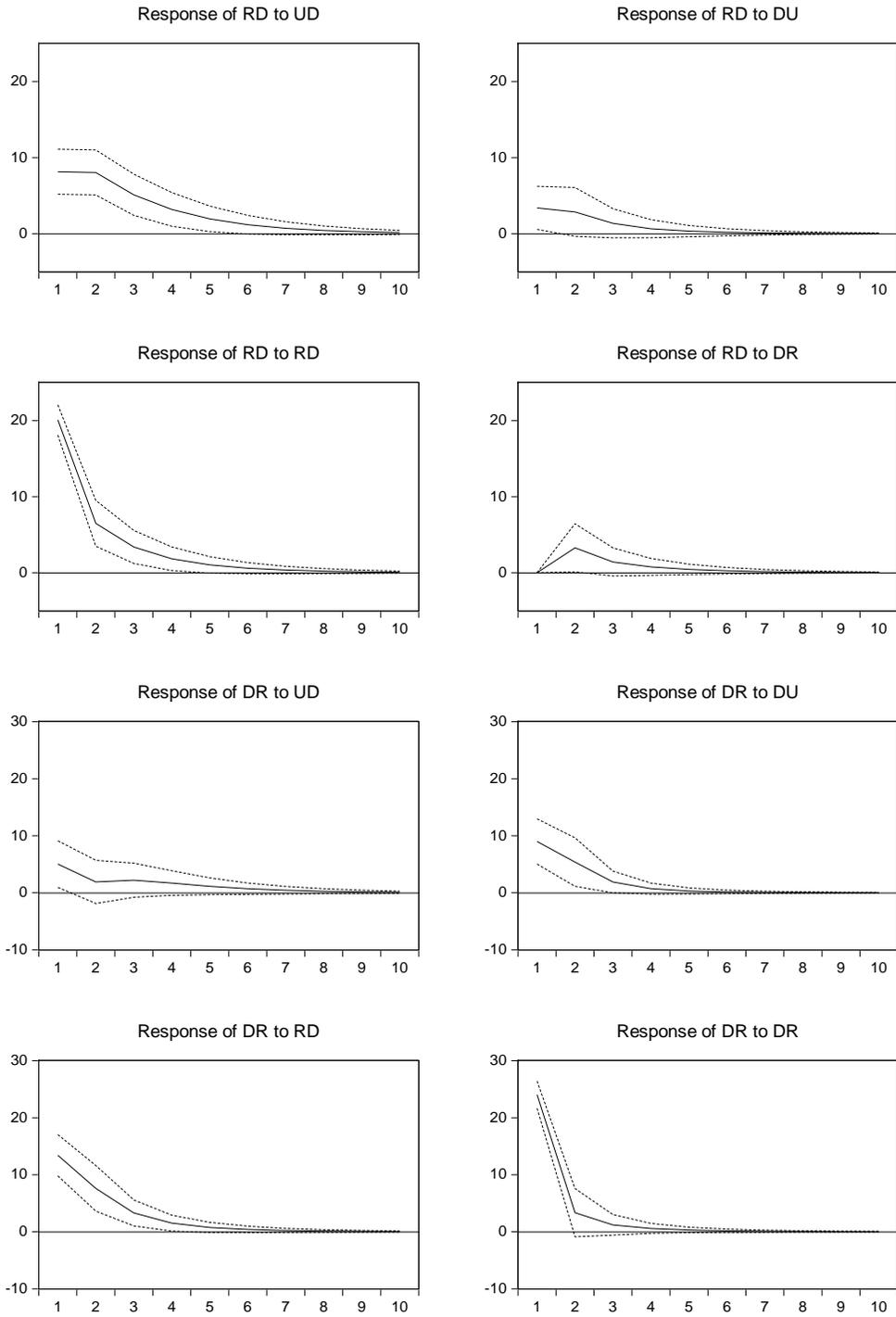


Figure 2.3 Impulse Responses for Second Period (cont.)

국문초록

2차 북핵위기에 나타난 양자주의적 상호성의 연구:

벡터자기회귀모형을 통한 시계열적 분석

심 규 희

국제학과 국제협력 전공

서울대학교 국제대학원

지난 10년동안 국제사회는 북한 핵 위기에 대한 국제사회의 효과적 대응이 무산되는 우려스런 상황을 지켜볼 수 밖에 없었다. 학계에서도 이런 상황이 지속되는 동안 북한정책을 둘러싼 논쟁이 활발하게 이루어졌다.

이러한 논쟁은 크게 두 가지 유형으로 전개되었다. 하나는 포용정책을 지지하는 입장이고 다른 하나는 포용정책에 대해 다소 회의적인 입장이다. 하지만 이 두 가지 중에서 어떤 입장을 선택하더라도 가장 주목을 끌고 추론의 대상이 되는 주제는 북한이 과연 상호주의적 정책에 조응할 준비가 되어있는가 하는 점이다.

북한에 대한 어떤 정책을 구사하더라도 그 성공과 실패의 여부는 결국 북한이 어떤 반응으로 나올 것인가에 달려있다. 따라서 북한이 유화적 제의에 대하여 호의적으로 반응할 것인지, 아닌지의 여부를 예측하는 것은 효과적인 대북한정책의 구상에 아주 유용한 요소이다.

이 연구는 2001년부터 2010년까지 한국, 미국, 북한 간에 발생한 상호작용을 분석하기 위하여 지난 10년간의 이벤트를 통계적 데이터로 구성하여 정량적 분석을 한 결과이다.

북한이 이 기간 동안 북한이 국제관계에서 상호주의적 관계, 상호주의에 역행하는 관계, 정책마비적 관계, 삼자적 관계 중에서 어떤 유형의 교섭상대이었는지를 파악하기 위하여 벡터자동회귀모델의 통계적 기법을 적용하였다.

지난 10년간의 이벤트를 통계적으로 분석한 결과 북한이 이 기간 중 미국에 대해서는 지속적으로 상호주의적 대응을 하였고, 한국에 대해서도 이 기간 중 후반부에서는 상호주의적 대응을 하였다는 점이 발견되었다. 반대로 이 기간 중에 어떤 경우에도 북한이 한국과 미국의 협력적 제안에 대하여 공격적으로 대응하는 역상호주의적 반응을 보인 경우는 한 번도 없었다.

또한 일각의 주장과는 달리 북한이 미국과 한국과의 관계를 분열시키려는 시도를 한다는 가설은 입증되지 않았고, 실제로는 북한이 미국이나 한국 중 어느 일방에서 협력적 제안을 받은 경우에 다른 상대방에 대한 협력적 대응도 같이 증가하는 추세를 보였다.

이 분석결과에 비추어 보면 지난 10년 간은 중요한 기회를 상실한 기간으로 보인다. 과거 북한의 행동을 보면 북한이 보다 협력적 관계를 수립할 의향이 있다는 점에서 북한에 대하여 보다 적극적인 포용정책을 구사하였다면 지난 10년 간의 위기상황은 실제보다 훨씬 호전되었을 가능성이 높다.

주요어: 북핵문제, 남북관계, 북미관계, 상호주의, 벡터자동회귀분석,

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