

Update: Options on North Korea

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Overview

This is an update to a July analysis. This analysis is derived from giCompute advanced analytics cloud based platform for estimating the decision calculus of the major groups and actors regarding the options on North Korea. giCompute incorporates the principles of game theory, statistics and decision science to calculate the positions stakeholders adopt and more importantly the impact of their actions on the overall outcome. Using this process, we estimated the overall utility values of the various factions and stakeholders involved in the options regarding North Korea. These calculations helped us estimate the degree to which stakeholders would support and influence the range of outcomes related to options on North Korea. We then forecasted a most likely pathway. The results are driven by expert aggregated data through giCompute distributed survey technology. Below are the key results.

Most Likely Outcome is a Diplomatic Solution

giCompute results indicate the most likely outcome will eventually evolve from status quo conditions to a diplomatic solution. Under status quo conditions, North Korea continues to conduct missile and nuclear tests. In return, the United States presses for more sanctions and attempts to disrupt North Korean missile tests. Under these conditions, giCompute analytics indicates the parties will likely engage in secret and open diplomacy, likely resulting in the dual track of increased public pressure by the United States on North Korea, while decreasing sanctions on North Korea or some type of actions that discretely de-escalates the stand-off. The second most likely outcome is continuation of the status quo, with potential for increased sanctions. A nuclear exchange is highly unlikely.

Diplomatic Solution Requires Reduction in Sanctions in Return for a North Korean Testing Freeze

Spatial bargaining results indicate two possible outcomes within the zone of bargaining between the United States and North Korea. The first option is the diplomatic track whereby the U.S. abandons sanctions pressure, commits to diplomacy and as a trade-off North Korea freezes further development related to its nuclear program (seen on the graph on the (1,2)). The second possible outcome is the United States limits sanctions while as a trade-off North Korea maintains its nuclear weapons and advanced ballistic missile but does not develop ICBM (Inter Continental Ballistic Missiles) technology (seen on the graph at (2,1)). Spatial bargaining analysis reveals that these two options produce better results than the current status quo conditions from the self-interested perspective of both Kim Jung Un and President Trump.

Determining Factors

The factors determining the outcomes pertaining to options regarding North Korea are U.S. security concerns, regional security concerns, the U.S. image from the perspective of the Trump administration, and North Korea's security concerns.

Friction

The pathway that generates the most friction between stakeholders is potential open diplomacy between North Korea and the U.S. The most divergent stakeholders driving this friction remain China and Kim Jong Un. Kim Jong Un prefers regional security concerns not be met so that he can continue to use it as leverage for his own political survival. In contrast China prefers most

regional security concerns pertaining to North Korea be met as part of its desire for stability on its border. China prefers some of the U.S. concerns be addressed to avoid confrontation. In contrast Kim Jong Un seeks to weaken the American image while raising its security concerns through actions such as continued ballistic missile testing.

Reliability Testing: Monte Carlo Simulations

Monte Carlo simulations were conducted across 40 alternative futures with a 90% variance probability and a change of $\pm 10\%$ in stakeholder influence. In each simulated alternative future, we randomized 1 factor and 1 factor option while keeping the remaining factors constant. Monte Carlo simulations indicate a 52% chance Kim Jong Un is on a path toward de-escalation through secret or public diplomacy. The simulations also show an 87% chance the United States will either attempt to de-escalate the situation through either secret diplomacy or public diplomacy between the Trump administration and the North Koreans

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About giCompute: Multi-Stakeholder Issues Driven by Human Factors

In our increasingly complex world, decision-makers in governments, corporations, law firms, educational institutions, healthcare organizations, and the news industry increasingly turn to data-driven algorithms to solve problems. Rules based systems, also known as formal modeling, allow us to anticipate individual, group and institutional behavior so long as the theory or formal rules describing the behavior are valid along with the relevant assumptions. Outcomes are driven by multiple factors that vary according to stakeholders’ priorities and levels of influence. Despite advances in data collection and computing technologies such as artificial intelligence (AI), most of the world’s information remains uncaptured when it comes to the daily decisions by people and organizations. We can overcome these barriers by capturing context specific data through the aggregation of stakeholder preferences and testing of factors driving any issue.

Estimated Payoff Results for Options on North Korea

Below is a table of the estimated utility payoffs score (net benefits) for each of the major groups and stakeholders regarding options on North Korea. The scenario closest to the current reality (status quo) is indexed at a score of zero. Any payoff score greater than zero is a better option than the status quo, while any payoff score less than zero is worse than the status quo. giCompute generates these group and stakeholder payoffs (i.e. utility value or net benefit) by first capturing stakeholder preferences across the factors defined in the issue setup. giCompute then sifts through the full combinations of possible payoff scores to identify the true payoff that corresponds to each scenario outcome.

Veto Influence Rankings: Below is the likely outcome for veto players is calculated by using the standard definition in game theory which assumes that if a veto player takes a position other than the weighted aggregate, the default outcome is status quo, i.e. no change.

Veto Influence Rankings

Most to Least likely outcome				
1. Open Diplomacy with Kim Jong Un / Relief	2. Secret Diplomacy / Relief	3. Status Quo – Frozen Conflict / Sanctions	4. Non Nuc Conflict	5. Nuclear Exchange

Results By Stakeholder

	Most to Least likely outcome				
	1. Open Diplomacy with Kim Jong Un / Relief	2. Secret Diplomacy / Relief	3. Status Quo – Frozen Conflict / Sanctions	4. Non Nuc Conflict	5. Nuclear Exchange
Kim Jong Un	19.0	-1.0	0.0	-20.0	-58.0
Party Apparatus	20.0	-3.0	0.0	-23.0	-68.0
Trump	63.0	12.0	0.0	-54.0	-67.0
DoD	51.0	36.0	0.0	-18.0	-55.0
Bannon Wing	57.0	12.0	0.0	-57.0	-70.0
NSC	51.0	36.0	0.0	-18.0	-55.0
China	55.0	12.0	0.0	-55.0	-82.0
South Korea	62.0	12.0	0.0	-53.0	-68.0
Japan	64.0	12.0	0.0	-52.0	-67.0

Results: giCompute results indicate the most likely outcome is Open Diplomacy. Under this outcome the US and North Korea will engage in open and public diplomacy to de-escalate the conflict. Using spatial bargaining, we determine that this diplomacy will result in a duel track of increased pressure by the US on North Korea and increased relief for North Korea. The second most likely outcome to remain at the status quo, and for sanctions to be enforced and maintained, without relief for North Korea. The least likely outcome is a nuclear exchange.

Determining Factors

Below are the defined outcomes and the factors necessary for each outcome pathway to occur.

Outcome Pathways

POSSIBLE OUTCOMES DETERMINING FACTORS

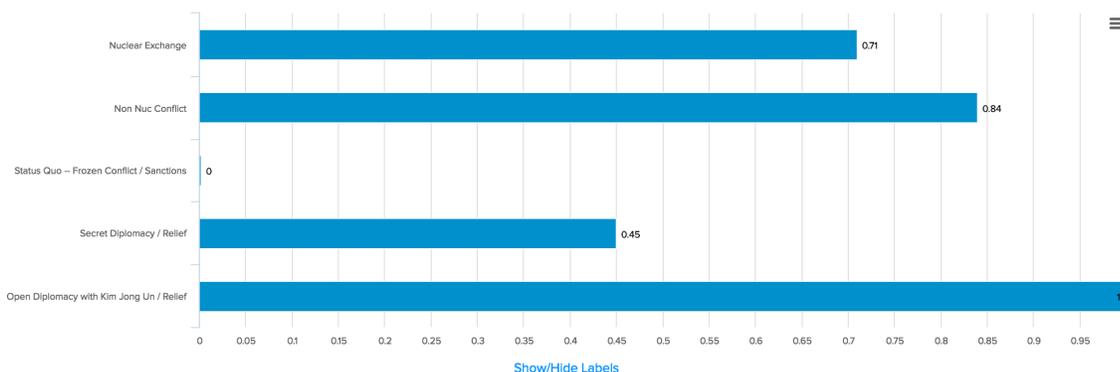
	Nuclear Exchange	Non Nuc Conflict	Status Quo -- Frozen Conflict / Sanctions	Secret Diplomacy / Relief	Open Diplomacy with Kim Jong Un / Relief
US Security Concerns	Conflict Fallout	Worse than SQ	Worse than SQ	Better than SQ	Better than SQ
Regional Security Concerns	Not Met	Not Met	SQ	SQ	Most Met
US Image from Trump View	Weakens image	Weakens image	Status Quo	Status Quo	Improves Image
North Korean Security Concerns	Conflict Fallout	Worse than SQ	Better than SQ	Better than SQ	Mostly Met

Results: The factors determining the outcomes pertaining to the issue of options on North Korea are U.S. security concerns, regional security concerns, the US image from the perspective of the Trump administration, and North Korean security concerns.

Cost of Friction

The cost of friction indicates the degree of disagreement between the stakeholders and groups across each scenario.

Cost of Friction For Outcomes

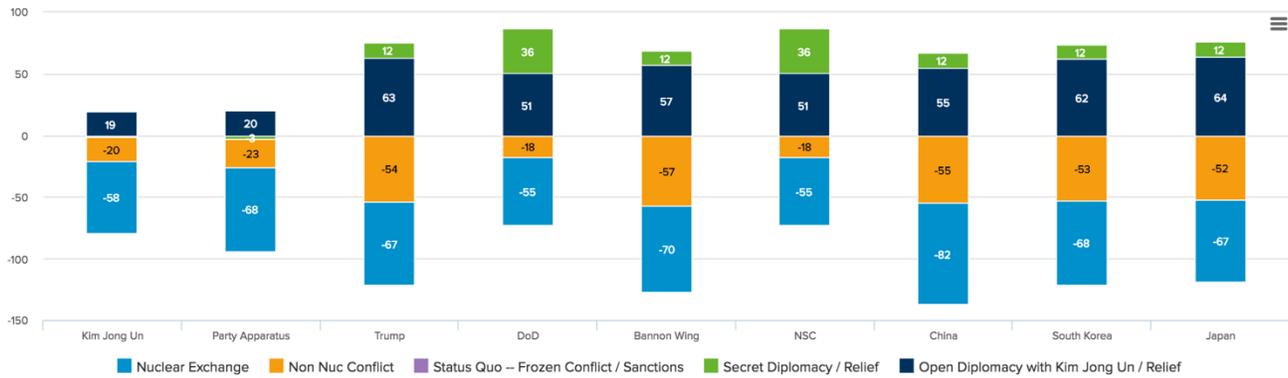


Results: The pathway generating the most friction between stakeholders is Open Diplomacy between the US and North Korea

Degree of Stakeholder Convergence

Degree of Convergence: The chart below shows the range of utility payoffs for the stakeholders across the various defined scenarios. Misalignment of the bars and colors within the bars indicates disagreement between stakeholders. Alignment indicates agreement.

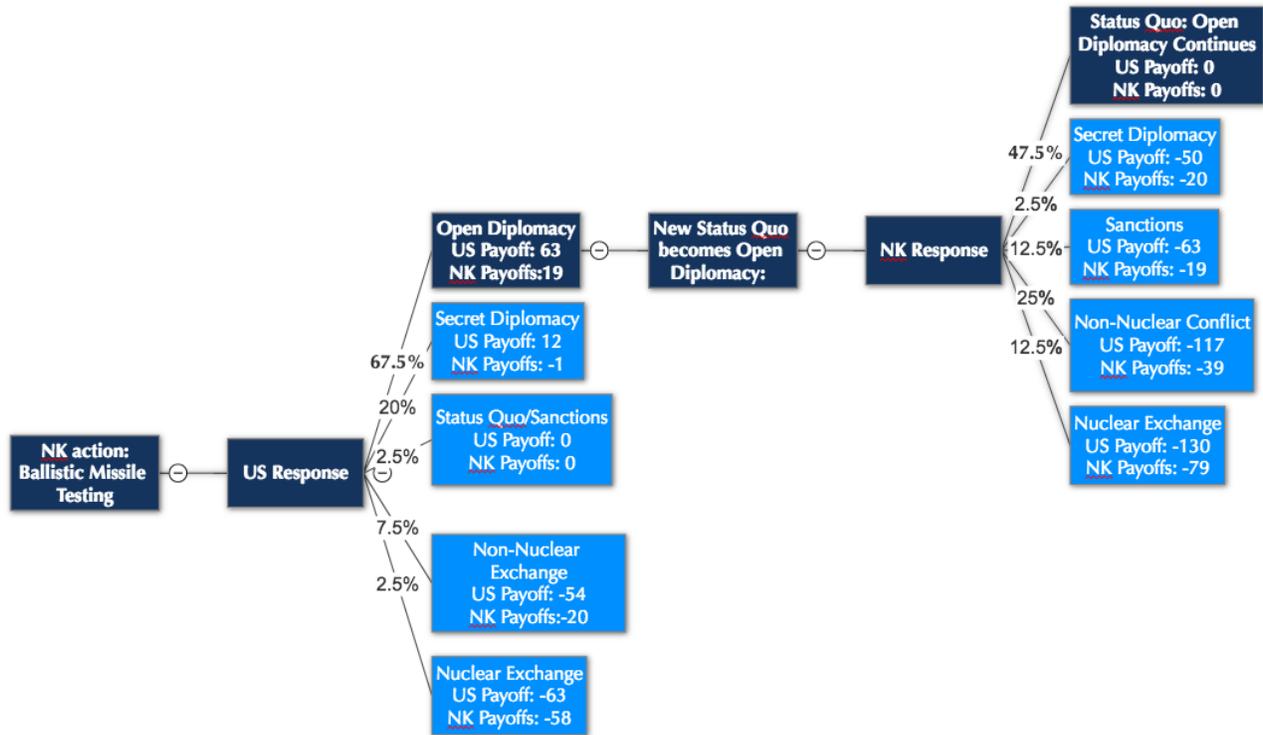
Degree of Convergence For Individual Stakeholders



Results: The most divergent stakeholders driving this friction remain China and Kim Jong Un. Once again, Kim Jong Un prefers regional security concerns not be met so that he can continue to use it as leverage for his own political survival. In contrast China prefers most regional security concerns pertaining to North Korea be met as part of its desire for stability on its border. China prefers some of the U.S. concerns be addressed to avoid confrontation. In contrast Kim Jong Un seeks to weaken the American image while raising its security concerns by minimizing risk of military action by the US.

Decision Tree Analysis

Below is a game-theory based decision tree depicting the utility payoffs and the probability of actions by the United States and North Korea. The most likely pathway is highlighted in dark blue.



Results: giCompute results indicate the most likely action for the United States and North Korea is a tit-for-tat diplomatic solution.

Move 1: North Korea continue ballistic missile testing

Move 2: U.S. seeks diplomatic solution

Move 3: North Korea responds with diplomatic solution.

Spatial Bargaining

In international crises, actors recognize that the most preferred outcome is often impossible to obtain. They therefore seek trade-offs despite non-cooperative bargaining settings. Spatial bargaining is a methodology that models the representation of issues in multidimensional space and identifies areas of potential agreement between multiple actors and multiple issues.

Using Spatial Bargaining we calculate feasible solutions to the North Korean crisis. By determining the preferred outcomes for the negotiations, plotting them on a plane, and comparing them to the status quo, we can find the bargaining range of each actor. Then we can determine the range of overlap, which indicates if theoretical bargaining zone that would produce outcome better than the status quo for both sides. This process can be seen below.

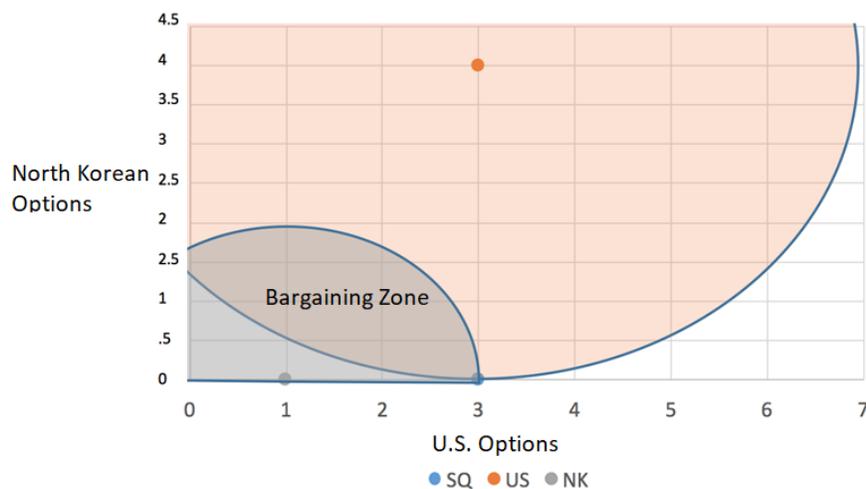
Bargaining Options: Our analysts have identified possible options for both the United States and North Korea to game determine the likely outcome of the open diplomacy our model predicts. Below we see the options for negotiations that the US and North Korea have.

U.S. Options

0. Do Nothing	1. US Diplomacy	2. Sanctions	3. Tougher Sanctions	4. Foreign Internal Defense	5. Air Strikes	6. Ground Troops	7. Nuclear Exchange
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North Korean Options

0. Develop Nuclear Weapons and ICBM's	1. Develop Nuclear Weapons and Advanced Ballistic Missiles	2. Nuclear Program Frozen	3. Abandon Missile Program	4. North Korea Abandon Nuclear Program
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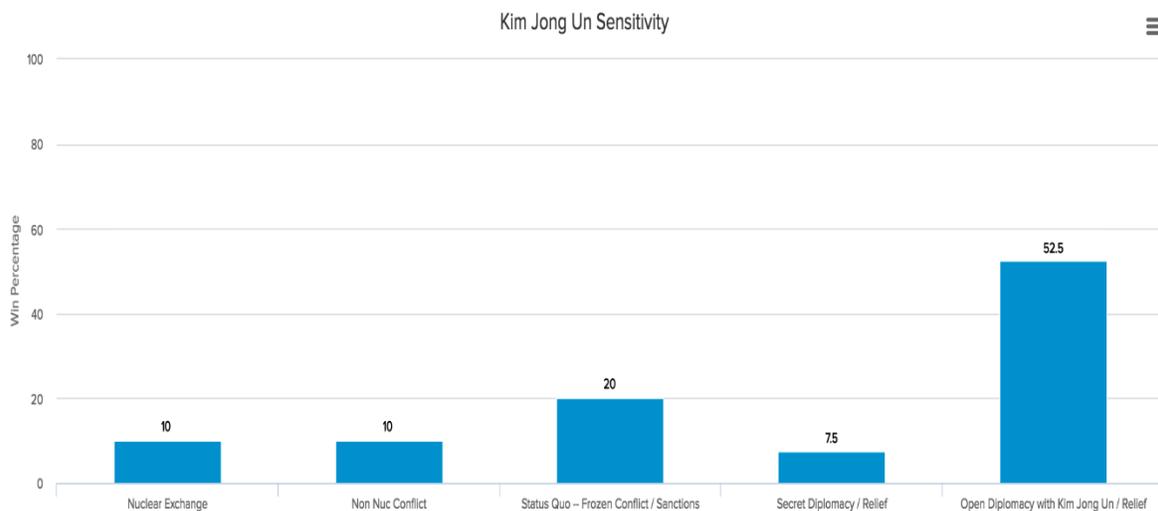
Results: Spatial bargaining results indicate two possible outcomes within the zone of bargaining between the United States and North Korea. The first option is the diplomatic track whereby the U.S. abandons sanctions pressure and instead commits to diplomacy whereby as a trade-off North Korea freezes further development related to its nuclear program (seen on the graph on the (1,2)). The second possible outcome is the United States limits sanctions while North Korea and as a trade-off North Korea maintains its nuclear weapons and advanced ballistic missile but does not develop ICBM (Inter Continental Ballistic Missiles) technology (seen on the graph at (2,1)). Spatial bargaining analysis reveals that these two options produce better results than the current status quo conditions from the self-interested perspective of both Kim Jung Un and President Trump.

Reliability Testing: Monte Carlo Simulations

We provide two methods to assess the reliability of the model results. Choosing Randomize by Level under Sensitivity Type will activate a Monte Carlo computation while choosing Closest Pair by Level activates a sensitivity analysis computation. The user can select various parameter options for Monte Carlo and sensitivity analysis computations. Number of futures determines how many simulations are run. Influence Percent Variance selects how much the influence of a stakeholder can vary under randomization. Factor level determines how many factors are randomized. A selection of 0 holds it constant. Factor option level selects the number of factor options that are randomized. Shock probability selects the probability that randomization occurs.

Monte Carlo simulations were conducted across 40 alternative futures with a 90% variance probability and a change of $\pm 10\%$ in stakeholder influence. In each simulated alternative future, we randomized 1 factor and 1 factor options while keeping the remaining factors constant.

Winning outcomes over 40 of 40 trials



	Nuclear Exchange	Non Nuc Conflict	Status Quo – Frozen Conflict / Sanctions	Secret Diplomacy / Relief	Open Diplomacy with Kim Jong Un / Relief
Overall	2.5%	2.5%	7.5%	25%	62.5%
Party Apparatus	2.5%	25%	7.5%	0%	65%
Kim Jong Un	10%	10%	20%	7.5%	52.5%
NSC	15%	15%	5%	25%	40%
Bannon Wing	2.5%	17.5%	0%	7.5%	72.5%
DoD	15%	7.5%	7.5%	30%	40%
Trump	2.5%	7.5%	2.5%	20%	67.5%
South Korea	0%	12.5%	12.5%	17.5%	57.5%
China	2.5%	10%	15%	15%	57.5%
Japan	2.5%	17.5%	0%	10%	70%

Results: Monte Carlo simulations were conducted across 40 alternative futures with a 90% variance probability and a change of $\pm 10\%$ in stakeholder influence. In each simulated alternative future, we randomized 1 factor and 1 factor option while keeping the remaining factors constant. Monte Carlo simulations indicate a 52% chance Kim Jong Un is on a path toward public diplomacy to de-escalate the conflict. The simulations also show a 67% chance the United States will either attempt to de-escalate the situation through public diplomacy between the Trump administration and the North Koreans. Because these positions are no longer divergent, Public Diplomacy will become the most likely outcome, and the likelihood of a nuclear exchange becomes low.