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# Game Theory:
# Can a Round of Poker Solve Afghanistan's Problems?

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Analyzing the ill-structured problem that is southern Afghanistan noticeably tests the bounds of traditional military planning doctrine. Identifying and framing the problem, isolating centers of gravity, and even articulating an attainable end-state given the tangle of tribal violence, narco-trafficking, and religious fanaticism can drive otherwise mild mannered planners to the verge of physical violence. Training and Doctrine Command's Pamphlet 525-5-500 goes as far as predicting an expected "lack of professional consensus" when tackling such a "wicked problem"[1]. Fortunately (or unfortunately), ill-structured problems do not exist solely in the realm of military conflict. Social scientists, political theorists, and economists routinely grapple with their likes. Over the past century they have devoted much scholarly effort toward their mitigation, if not solution. One theory that may particularly apply to southern Afghanistan is that of games. Although one can quickly become bogged down with the mathematics of game theory, a rudimentary understanding of its basic principles can prove quite beneficial to military planners. What follows is a brief primer and simple demonstration of how game theory can be applied to help military planners frame the problem of developing a viable counterinsurgency strategy in southern Afghanistan.

The genesis of the theory of games is credited to John von Neumann, a Hungarian mathematician, who sought to generate a fresh mathematical approach to economic theory. In 1944, together with Oscar Morgenstern, a German economist, he published the theory's seminal work: *A Theory of Games and Economic Behavior.* Much of von Neumann's early work on game theory centered around deriving a mathematical description of the card game poker. Poker contained all the aspects of what von Neumann considered a "game": a combination of single actions centered around an individual player's strategy; an interdependency between the strategies of the various players at the table; competing and even conflicting interests between the players; imperfect information as to each players strategy and actions; and an element of randomness. Von Neumann considered strategy in poker to be a combination of the tactics used when betting and bluffing. Through observing (and playing) the game he noted three things about its strategic nature. First, a player without a strategy was doomed. Second, a player who failed to adapt his strategy to that of the other players was equally doomed. Third, a novice player, without a strategy, although doomed to failure in the long run, could disrupt a seasoned, strategic player. Von Neumann attributed this final observation to the random nature of the novice's play. He concluded that the seasoned player, who could inject a sense of randomness into his strategy, thus hiding it from his opposition, would be the most successful[2]. Von

Neumann's ideas instantly resonated around the scientific community. By the end of the 1950s, economists, social scientists, physicists, and even biologists had all joined mathematicians in contributing to the theory's body of knowledge. The United States Military was also very interested in the theory of games. The nascent Rand Corporation devoted much of its early work toward the theory's development and application to military strategy. Their work continues to this day[3].

A simple application of game theory can be demonstrated with the following thought problem centered on a counterinsurgency twist to the classic game, the prisoner's dilemma[4]. Assume for a minute that military planners in a particularly remote region of southern Afghanistan find themselves faced with the problem of how to employ coalition capabilities to support an enduring capacity for stability within their operating environment before Taliban forces can consolidate in the region[5]. They identify three critical planning factors. First, the villages in the region face a choice of whether to support the Coalition or the Taliban. Second, the villages are isolated and cannot readily communicate with each other. Third, although the villages are isolated, their decisions are inter-related. Each village that chooses to support the Coalition will provide a public benefit to both villages. This benefit is realized through the aggregation of a number of factors including increased legitimacy and momentum for the Coalition's effort and the fact every village that supports the Coalition is one less that Taliban can use as a sanctuary. For the purposes of this example we will assign this benefit a value of B = 4. Unfortunately, choosing to support the Coalition will also come with a private cost of c = 6 in that doing so will expose the village to retaliation from the Taliban. Conversely, by choosing to support the Taliban, each village will generate a collective cost of C = 4 to all villages resultant from the Taliban's gain. However, the village itself will enjoy a private benefit of b = 6 based on local security provided by the Taliban. Table 1 contains a summary of these costs and benefits with initial values assigned to each. A little algebra yields the matrix of available choices describing the game's structure represented in Table 2. Consider the upper left quadrant as an example. If both villages elect to support the Coalition, both receive the public benefit, 2 times B, but both also incur their own private cost, c. Hence the quantified result of each village's decision is 2B-c. Applying the values from Table 1 yields the results of the game, which can be found in Table 3.

**Table 1: Definitions and Values of Game Variables**

| | Variable | Value |
|---|---|---|
| **Public Benefit** | B | 4 |
| **Private Cost** | c | 6 |
| **Public Cost** | C | 4 |
| **Private Benefit** | b | 6 |

**Table 2: Game Structure**

| | | Village East | |
|---|---|---|---|
| | | Support Coalition | Support Taliban |
| **Village West** | Support Coalition | 2B-c, 2B-c | B-c-C, B+b-C |
| | Support Taliban | B+b-C,B-c-C | b-2C, b-2C |

| Table 3: Game Results | | | |
|---|---|---|---|
| | Village East | | |
| Village West | | Support Coalition | Support Taliban |
| | Support Coalition | 2, 2 | -6, 6 |
| | Support Taliban | 6,-6 | -2, -2 |

A quick look at the results suggests success for the Coalition. Each village will realize a benefit of 2 if they both elect to support the Coalition. Unfortunately, a deeper analysis does not bode as well. In fact, the true winner is the Taliban. Game theory predicts that both villages will tend toward the lower right quadrant, or what is called the Nash Equilibrium. First proposed by John Forbes Nash, the American mathematician and subject of the movie *A Beautiful Mind*, the Nash Equilibrium arises when the game's players both adopt their most advantageous individual strategy. Although in this game, the villages will realize a maximum collective benefit if they both support the coalition, we must remember our rule that the villages are isolated and not able to communicate with each other. In light of this imperfect information about their neighbor's choice, each village's best strategy is to support the Taliban. In doing so, they hedge against their maximum possible cost (-6 of supporting the Coalition alone) while leaving open the prospect of receiving their maximum possible benefit (6 of supporting the Taliban alone). The result of both villages adopting this strategy is the Nash Equilibrium depicted in the lower right corner of Table 3.

Is all hope lost? Certainly not. The game reveals two strategies the Coalition can employ to fill gaps in knowledge and bend the odds in its favor. The first option is to take measures to change the cost/benefit values. One way for the Coalition to accomplish this could be through attempting to lower the private cost villages incur for their support by stationing combat outposts, aimed at countering Taliban retaliation, in their midst. Were such a change assessed to reduce the private cost to $c = 2$ the Nash Equilibrium would shift to the upper left quadrant making support of the Coalition the villages' most attractive strategy. Although in reality quantifying the effectiveness of such changes might prove difficult, simply knowing where to focus effort would be of great value to military planners. The second option involves changing the rules of the game. By letting the villages collaborate and form a coalition, they could compromise to realize the maximum societal gain available from both choosing to support the Coalition…if they trust each other!

The real situation in southern Afghanistan is of course infinitely more complex than a choice to be made by two villages. Proper application of game theory to the region would involve identifying all the players (Coalition, Taliban, GIRoA, Tribal Leaders, Warlords, Pakistan, Iran, etc), the proper game (the prisoner's dilemma is just one of many), and assigning realistic values to the game's parameters (perhaps the most difficult task). Contemporary game theory, with the aid of computers, can easily accommodate multi-player games. Choosing the game is a matter of understanding how the players interact and the environment they interact in. Although by no means a trivial task, such an analysis could prove invaluable to military planners. Finding a model that accurately reflects the contemporary operating environment would go a long way toward framing the problem and validating critical planning factors. The final step, assigning value to the game's parameters and calculating the game's results, does involve some mathematical calculations. Yet, if done properly, such results can go a long way toward filling gaps in knowledge. So, to answer the question posed in the title: Can a round of poker solve Afghanistan's problems? Not exactly, but understanding the basics of game theory can offer military planners an alternative way to design solutions to the wicked problems they may face.

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**References**

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3. www.rand.org/about/history
4. Acre M., Daniel G. and Todd Sandler. *Counterterrorism: A Game-Theoretic Analysis*, The Journal of Conflict Resolution, Vol 49, No 2, April 2005.
5. Clark, Thomas G. *Know Your Doctrine – Is Doctrine Knowable About Problem Statements?* Retrieved 16 March 2009 from http://usacac.army.mil/blog/

**Note**

My counterinsurgency game is based on a similar game proposed by Acre M. and Sandler in their article. Their game is a three-choice prisoner's dilemma that pits the United States and the European Union against each other in determining a counter terror strategy of deterrence, in-action, or pre-emption. The mathematic derivations and initial cost/benefit values come directly from their example.