The Israel-Palestine Question – A Case for Application of Neutrosophic Game Theory

Dr. Sukanto Bhattacharya
School of Accounting, Economics & Finance
Deakin University

Dr. Florentin Smarandache
Department of Mathematics and Statistics
University of New Mexico, U.S.A.

Dr. Mohammad Khoshnevisan
School of Accounting and Finance
Griffith University

Abstract

In our present paper, we have explored the possibilities and developed arguments for an application of principles of *neutrosophic game theory* as a generalization of the fuzzy game theory model to a better understanding of the Israel-Palestine problem in terms of the goals and governing strategies of either side. We build on an earlier attempted justification of a game theoretic explanation of this problem by Yakir Plessner (2001) and go on to argue in favour of a neutrosophic adaptation of the standard 2x2 zero-sum game theoretic model in order to identify an optimal outcome

Key Words

Israel-Palestine conflict, Oslo Agreement, fuzzy games, neutrosophic semantic space

Background

There have been quite a few academic exercises to model the ongoing Israel-Palestine crisis using principles of statistical game theory. However, though the optimal solution is ideally sought in the identification of a *Nash equilibrium* in a cooperative game, the true picture is closer to a zero-sum game rather than a cooperative one. In fact it is not even a zero-sum game at all times, as increasing levels of mutual animosity in the minds of the players often pushes it closer to a sub-zero sum game. (Plessner, 2001).

As was rightly pointed out by Plessner (2001), the application of game theory methodology to the current conflict between Israel and the Palestinians is based on identifying the options that each party has, and an attempt to evaluate, based on the chosen option, what each of them is trying to achieve. The Oslo Agreement is used as an instance with PLO leadership being left to choose between two mutually exclusive options: either compliance with the agreement or non-compliance. Plessner contended that given the options available to PLO leadership as per the Oslo Agreement, the following are the five possible explanations for its conduct:

- The PLO leadership acts irrationally;
- Even though the PLO leadership wants peace and desires to comply, it is unable to do so because of mounting internal pressures;
- PLO leadership wants peace but is unwilling to pay the internal political price that any form of compliance shall entail;
- PLO leadership wants to keep the conflict going, and believes that Israel is so weak that it does not have to bear the internal political price of compliance, and can still achieve his objectives; or

- Given the fact that PLO leadership has been encouraging violence either overtly or covertly, it is merely trying to extract a better final agreement than the one achievable without violence

Plessner (2001) further argued that the main objective of the players is not limited to territorial concessions but rather concerns the recognition of Palestinian sovereignty over Temple Mount and the right of return of Palestinian refugees to pre-1967 Israel; within the territorial boundaries drawn at the time of the 1949 Armistice Agreements.

However, a typical complication in a problem of this kind is that neither the principal objective nor the strategy vectors remain temporally static. That is, the players' goals and strategies change over time making the payoff matrix a dynamic one. So, the same players under a similar set-up are sometimes found engaging in cooperative games and at other times in non-cooperative ones purely depending on their governing strategy vectors and principal objective at any particular point of time. For example, the PLO leadership may have bargained for a better final agreement using pressure tactics based on violence in the pre 9/11 scenario when the world had not yet woken up fully to the horrors of global terrorism and he perceived that the Israel was more likely to make territorial concessions in exchange of lasting peace. However, in the post 9/11 scenario, with the global opinion strongly united against any form of terrorism, its governing strategy vector will have to change as Israel now not only will stone-wall the pressure tactics, but will also enjoy more liberty to go on the offensive.

Moreover, besides being temporally unstable, the objectives and strategies are often ill-defined, inconsistent and have a lot of interpretational ambiguity. For example, while a strategy for the PLO leadership could appear to be keeping the conflict alive with the covert objective of maintaining its own organizational significance in the Arabian geopolitics, at the same time there would definitely have to be some actions from its side which would convey a clear message to the other side that it wants to end the conflict – which apparently has been its overt objective, which would then get Israel to reciprocate its overt intentions. But in doing so, Israel could gain an upper hand at the bargaining table, which would again cause internal pressures to mount on PLO leadership thereby jeopardising the very position of power it is seen trying to preserve by keeping the conflict alive.

The problem modelled as a standard 2x2 zero-sum game

		Palestine	
		I	**II**
Israel	**I**	1	-1
	II	0	-1
	III	0	-1
	IV	1	0

Palestine's strategy vector: (I – full compliance with Oslo Agreement, II – partial or non-compliance)

Israel's strategy vector: (I - make territorial concessions, II - accept right of return of the Palestinian refugees, III – launch an all-out military campaign, IV – continue stone-walling)

The payoff matrix has been constructed with reference to the row player i.e. Israel. In formulating the payoff matrix it is assumed that combination (I, I) will potentially end the conflict while combination (IV, II) will basically mean a status quo with continuing conflict. If Palestine can get Israel to either make territorial concessions or accept the right of return of Palestinian refugees without fully complying with the Oslo Agreement i.e. strategy combinations (I, II) and (II, II), then it marks a gain for the former and a loss for the latter. If Israel accepts the right of return of Palestinian refugees and Palestine agrees to fully comply with the Oslo Agreement, then though it would potentially end the conflict, it could possibly be putting the idea of an independent Jewish state into jeopardy and so the strategy combination (II, I) does not have a positive payoff for Israel. If Israel launches an all-out military campaign and forces Palestine into complying with the Oslo Agreement i.e. strategy combination (III, I) then it would not result in an exactly positive payoff for Israel due to possible alienation of world opinion and may be even losing some of the U. S. backing. If an

all-out Israeli military aggression causes a hardening of stance by Palestine then it will definitely result in a negative payoff due to increased violence and bloodshed. If however, there is a sudden change of heart within the Palestinian leadership and Palestine chooses to fully abide by the Oslo Agreement without any significant corresponding territorial or political consideration by Israel i.e. strategy combination (IV, I), it will result in a potential end to the conflict with a positive payoff for Israel.

In the payoff matrix, the last row dominates the first three rows while the second column dominates the first column. Therefore the above game has a *saddle point* for the strategy combination (IV, II) which shows that in their attempt to out-bargain each other both parties will actually end up continuing the conflict indefinitely!

It is clear that Palestine on its part will not want to ever agree to have full compliance with the Oslo Agreement as it will see always see itself worse off that way. Given that Palestine will never actually comply fully with the Oslo Agreement, Israel will see in its best interest to continue the status quo with an ongoing conflict, as it will see itself ending up on the worse end of the bargain if it chooses to play any other strategy.

The equilibrium solution as we have obtained here is more or less in concurrence with the conclusion reached by Plessner. He argued that given the existing information at Israel's disposal, it is impossible to tell whether PLO leadership chooses non-compliance because it will have to pay a high internal political price otherwise or because it may want to keep the conflict alive just to wear down the other side thereby opening up the possibility of securing greater bargaining power at the negotiating table. The point Plessner sought to make is that whether or not PLO leadership truly wants peace is immaterial because in any case it will act in order to postpone a final agreement, increase its weight in the international political arena and also try to gain further concessions from Israel.

Case for applying neutrosophic game theory

However, as is quite evident, none of the strategy vectors available to either side will remain temporally stationary as crucial events keep unfolding on the global political

stage in general and the Middle-Eastern political stage in particular. Moreover, there is a lot of ambiguity about the driving motives behind PLO leadership's primary goal and the strategies it adopts to achieve that goal. Also it is hard to tell apart a true bargaining strategy from one just meant to be a political decoy. This is where we believe and advocate an application of the conceptual framework of the neutrosophic game theory as a generalization of the dynamic fuzzy game paradigm.

In generalized terms, a well-specified dynamic game at time t is a particular interaction ensemble with well defined rules and roles for the players within the ensemble, which remain in place at time t but are allowed to change over time. However, the players often may suffer from what is termed in organizational psychology as "role ambiguity" i.e. a situation where none of the players are exactly sure what to expect from the others or what the other players expect from them. In the context of the Israel-Palestine problem, for example, PLO leadership would probably not have been sure of its exact role when Yasser Arafat met with U.S. and Israeli leadership at the Camp David Summit ostensibly to hammer out a peace agreement. Again following Plessner's argument, Arafat went to that Summit against his free will and would have liked to avoid Camp David if he could because he did not want to sign any final agreement that was short of a complete renunciation of its sovereign existence by Israel. With no such capitulation forthcoming from Israel, it was in PLO leadership's best interest to keep the conflict alive. However, it did have to give certain overt indications mainly to keep U.S. satisfied that a negotiated settlement was possible and was being preferred over letting loose Hamas mercenaries on the streets. Under such circumstances, it would be quite impossible to pick out a distinct governing strategy which the other side could then meet with a counter-strategy.

However, one positive aspect about Summits such as the Camp David Summit is that they make the game scenario an open one in the sense that the conflicting parties are able to dynamically construct and formulate objectives and strategies in the course of their peaceful, mutual interaction within a formally defined socio-political set-up. This allows a closer analytical study of the negotiation process where the negotiation space may be defined as $N_{Palestine} \cap N_{Israel}$.

There is a *fuzzy semantic space* which is a collective of each player's personal views about what constitutes a "just deal" (Burns and Rowzkowska, 2002). Such views are formed based on personal value judgements, past experience and also an expectation about the possible best-case and worst-case negotiation outcomes. This fuzzy semantic space is open to modifications as negotiations progress and views are exchanged resulting in earlier notions being updated in the light of new information.

This semantic space however remains fuzzy due to vagueness about the exact objectives and lack of precise understanding of the exact stakes which the opposing parties have *from their viewpoints*. That is to say, none of the conflicting parties can effectively put themselves in the shoes of each other and precisely understand each other's nature of expectations.

This is borne out in the Camp David Summit when probably one side of the table was thinking in terms of keeping the conflict alive while giving the impression to the other side that they were seriously seeking ways to end it. This immediately makes it clear why such a negotiation would break down, simply because it never got started in the first place!

If the Israel-Palestine problem is formulated as a dynamic fuzzy bargaining game, the players' *fuzzy set judgement functions* over expected outcomes may be formulated as follows according to the well known rules of fuzzy set algebra (Zadeh, 1965):

For Palestine, the fuzzy evaluative judgment function at time t, **J (P, t)** will be given by the fuzzy set membership function $M_{J(P, t)}$ which is expressed as follows:

$$M_{J(P, t)}(x) = \begin{cases} c \in (0.5, 1); \text{ for } \wp_{Worst} < x < \wp_{Best} \\ 0.5; \text{ for } x = \wp_{Worst}; \text{ and} \\ 0; \text{ for } x \leq \wp_{Worst} \end{cases}$$

Here $\wp_{Best}$ is the best possible negotiation outcome Palestine could expect; which, according to Plessner, would probably be Israeli recognition of the right of return of Palestinian refugees to their pre-1967 domicile status.For Israel on the other hand, the fuzzy evaluative judgment function at time t, **J (I, t)** will be given by the fuzzy set membership function $M_{J(I, t)}$ which will be as follows:

$$M_{J(I,t)}(y) = \begin{cases} 1; \text{ for } y \geq \Im_{Best} \\ c' \in (0.5, 1); \text{ for } \Im_{Worst} < y < \Im_{Best} \\ 0.5; \text{ for } y = \Im_{Worst}; \\ 0; \text{ for } y \leq \Im_{Worst} \end{cases}$$

Here $\Im_{Worst}$ is the worst possible negotiation outcome Israel could expect; which, would concur with the best expected outcome for Palestine.

However, the semantic space $N_{Palestine} \cap N_{Israel}$ is more generally framed as a *neutrosophic semantic space* which is a three-way generalization of the fuzzy semantic space and includes a third, neutral possibility whereby the semantic space cannot be de-fuzzified into two crisp zero-one states due to the incorporation of an intervening state of "indeterminacy". Such indeterminacy could practically arise from the fact that any mediated, two-way negotiation process is likely to become *over-catalyzed* by the subjective utility preferences of the mediator – in case of the Israel-Palestine problem; that of the U.S. (and to a lesser extent; that of some of the other permanent members of the UN Security Council).

Neutrosophy is a new branch of philosophy that is concerned with *neutralities* and their interaction with various ideational spectra (Smarandache, 2000). Let *T*, *I*, *F* be real subsets of the *non-standard interval* $]^-0, 1^+[$. If $\in > 0$ is an infinitesimal such that for all positive integers n and we have $|\in| < 1/n$, then the non-standard finite numbers $1^+ = 1+\in$ and $0^- = 0-\in$ form the boundaries of the non-standard interval $]^-0, 1^+[$. Statically, *T*, *I*, *F* are *subsets* while dynamically, as in our case when we are using the model in the context of a dynamic game, they may be viewed as *set-valued vector functions*. If a logical proposition is said to be *t*% true in *T*, *i*% indeterminate in *I* and *f*% false in *F* then *T*, *I*, *F* are referred to as the *neutrosophic components*. Neutrosophic probability is useful to events that are shrouded in a *veil of indeterminacy* like the *actual*implied volatility of long-term options. As this approach uses a *subset-approximation* for truth values, indeterminacy and falsity-values it provides a better approximation than classical probability to uncertain events.

Therefore, for Palestine, the neutrosophic evaluative judgment function at time t, $\mathbf{J_N\ (P, t)}$ will be given by the *neutrosophic set membership function* $M_{J_N (P, t)}$ which may be expressed as follows:

$$M_{J_N (P, t)}(x) = \begin{cases} c \in (0.5, 1); \text{ for } \wp_{Worst} < x < \wp_{Best} \textbf{ AND } x \in T \\ 0.5; \text{ for } x = \wp_{Worst} \textbf{ AND } x \in T \\ 0; \text{ for } x \leq \wp_{Worst} \textbf{ AND } x \in T \end{cases}$$

For Israel on the other hand, the neutrosophic evaluative judgment function at time t, $\mathbf{J_N\ (I, t)}$ will be given by the *neutrosophic set membership function* $M_{J_N (I, t)}$ which may be expressed as follows:

$$M_{J_N (I, t)}(y) = \begin{cases} 1; \text{ for } y \geq \Im_{Best} \textbf{ AND } y \in F \\ c' \in (0.5, 1); \text{ for } \Im_{Worst} < y < \Im_{Best} \textbf{ AND } y \in F \\ 0.5; \text{ for } y = \Im_{Worst} \textbf{ AND } y \in F; \\ 0; \text{ for } y \leq \Im_{Worst} \textbf{ AND } y \in F \end{cases}$$

Pertaining to the three-way classification of neutrosophic semantic space, it is *t*% true in sub-space *T* that a mediated, bilateral negotiation will produce a favourable outcome within the evaluative judgment space of the Palestinian leadership while it is *f*% false in sub-space *F* that the outcome will be favourable within the evaluative judgment space of the Palestinian leadership. However there is an *i*% indeterminacy in sub-space *I* whereby the nature of the outcome may be neither favourable nor unfavourable within the evaluative judgment space of either competitor – for example if the negotiation process is over-catalyzed by the utility preferences of the mediator!

Conclusion

$M_{J_N (P, t)}(x)$ {or $M_{J_N (I, t)}(y)$} would be interpreted as Palestine's (or Israel's) degree of satisfaction with the negotiated settlement. Following Plessner's argument again, it is PLO leadership's ultimate objective to see the end of an independent Jewish state of Israel and if that be the case then of course there will always be an unbridgeable incongruence between $M_{J_N (P, t)}(x)$ and $M_{J_N (I, t)}(y)$ because of mutually inconsistent evaluative judgment spaces between the two parties to the conflict. Therefore, for any form of negotiation to have a positive result the first and foremost requirement would be to make the evaluative judgment spaces consistent. Because unless the evaluative

judgment spaces are consistent, the negotiation space will degenerate into a null set at the very onset of the bargaining process thereby pre-empting any equilibrium solution different from the status quo. However, by its very definition, since these spaces are not crisp, they are malleable to some extent (Reiter, 1980). That is, even while retaining their core forms, subtle changes could be induced to make these spaces workably consistent. Then the aim of the mediator should to make the parties redefine their primary objectives without necessarily feeling that such redefinition itself means a concession. When this required redefinition of primary objectives has been achieved can the evaluative judgment spaces generate a negotiation space that will not become null *ab initio*. However, there is also an indeterminate aspect to any process of mediated bilateral dialogues between the two parties due to the catalyzation effect brought about by the subjective utility preferences of the mediator (or mediators).

References:

Burns, T. R., and Rowzkowska, E., "Fuzzy Games and Equilibria: The Perspective of the General Theory of Games on Nash and Normative Equilibria", In: S. K. Pal, L. Polkowski, and A. Skowron, (eds.) *Rough-Neuro Computing: Techniques for Computing with Words*, Springer-Verlag, Berlin/London, 2002

Plessner, Yakir, "The Conflict Between Israel and the Palestinians: A Rational Analysis", *Jerusalem Letters/Viewpoints*, No. 448, 22 Shvat 5761, 15 February 2001

Reiter, R., "A Logic for Default Reasoning", *Artificial Intelligence*, Vol. 13, 1980, pp81-132

Smarandache, Florentin, *A Unifying Field in Logics: Neutrosophic Logic: / Neutrosophic Probability, Neutrosophic Set,* Preliminary report, Western Section Meeting, Santa Barbara, Meeting #951 of the American Mathematical Society, March 11-12, 2000

Zadeh, L. A., "Fuzzy Sets", *Information and Control*, Vol. 8, 1965, pp338-353