



# Ransom Demands by Pirates: Study of the Problem as a Bargaining Game

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Game theory has been defined as “the study of mathematical models of conflict and cooperation between intelligent rational decision-makers”.<sup>1</sup> It finds application in many diverse fields and has been keenly researched. Eight game-theorists have won the Nobel Memorial Prize in Economic Sciences. Robert Aumann, the inaugural president of the Game Theory Society, in his presidential address, stated that “game theory” is an unfortunate term for a study that might be better understood as “interactive decision theory”. Game theory as a branch of applied mathematics has been used extensively in fields ranging from economics and political science to psychology and biology. Application of game theory to international conflicts has also been extensively studied. From the military perspective, it initially remained restricted to larger strategic equations and specifically to nuclear deterrence situations. This structured study of how people with opposing interests interact in a conflict scenario can, however, provide a framework to study not only larger strategy issues but also low-intensity conflicts, for defence against terrorist attacks and even for countering piracy.

Unlike terrorism, which may be rooted in ideology or religious beliefs, piracy is essentially an economic transaction involving purely monetary considerations. Even if

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it is accepted that the roots of piracy off Somalia were in the sense of injustice that the local fishermen perceived due to poaching by extra regional trawlers or dumping of toxic wastes, which directly impacted their livelihood, it is obvious that the pirates are essentially looking for money that can be obtained as ransom for the hijacked ship and its crew.<sup>2</sup> The ransom paid is thus similar to a bargaining game where each side is trying to negotiate terms favourable to them. Mathematically this process of negotiation is very similar to the negotiations that may be undertaken by commercial firms, trade unions etc., even though there would be some peculiarities to each situation. Some of the existing models can therefore be directly applied to the transaction.

A negotiation is a “joint decision-making process of two or more parties working together to reach a mutually acceptable agreement over one or more issues”.<sup>3</sup> In any negotiation, there would be two parties, each of which would have a “limit” on what is acceptable. Before dwelling on piracy *per se* let us dwell on a simple commercial transaction such as, say, buying a house. The seller would have a figure considered the lowest acceptable. The buyer would similarly have the highest that can be paid. The overlap between the two is the area in which the final agreement may be reached. If the lowest acceptable is higher than the highest that can be paid, there is no overlap and there would be no transaction. In all other cases there would exist a Zone of Potential Agreement (ZOPA), as depicted in the Fig. 1.<sup>4</sup>

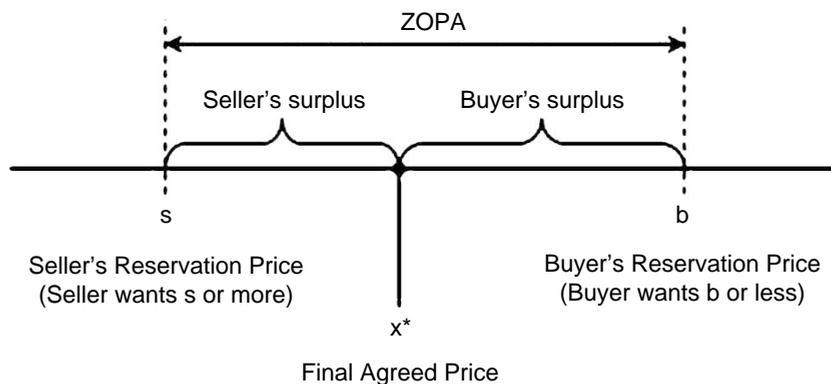


Fig 1. Zone of Potential Agreement (ZOPA).

The agreement can thus be reached within this ZOPA and the negotiation process is about each party trying to shift the final agreed price closer towards the opponent's limit and thus maximizing the "surplus". The problem frequently is of incomplete information in that each side does not know what the other side has determined as their limit or reserve price.

The problem that may be encountered is that the limits (and therefore the ZOPA) may vary over time. This may be due to the negotiation process itself or due to other factors such as depreciation of the property over the period of prolonged negotiations. The above example, with minor modifications, may also be suitable for the economic transaction that the pirates and the ship owners indulge in. The pirates would have a lower limit, below which they would not be willing to transact and the ship owners would similarly have an upper limit on what they are willing to pay (or capable of paying). Unlike a transaction of buying a house, however, the ransom situation has some peculiarities. It may be described as a "mutually hurting stalemate"<sup>5</sup> if both parties believe that the status quo is not satisfactory and that an agreement will benefit everybody.

Some commentators have described hostage negotiation in the pirates scenario as a "bilateral monopoly price negotiation that is structurally just a special case of chicken".<sup>6</sup> The rationale being that, unlike a

*... barrel of oil or a freight car full of soybeans which can trade on an extremely liquid market with innumerable buyers and sellers, a hostage has exactly one seller (the kidnappers) and exactly one buyer (the employer and/or family of the hostage). When there is only one buyer, the opportunity cost for ransoming the hostage is zero. Likewise, the employer and/or family have no realistic alternative means to recover the hostage. In order for everybody to walk away happy, we need a cooperate-cooperate outcome: the kidnapper has to give up the hostage and the employer/family has to give up a ransom.*

If this view is accepted and we model the situation on a bilateral monopoly negotiation only, two things should matter.<sup>7</sup>

- The first is the willingness to accept failure. The more willing you appear to terminate the negotiation process, the more bargaining power you have.

- The second is the capacity to pay. The pirate's demand, even in a monopoly situation, is pointless if it is beyond the capacity of the other party to pay.

As per this view, the “going rate” does not matter. In normal markets the going rate matters, but only because it provides the opportunities for substitutes and this creates the “law of one price”. It is “completely irrelevant that in the past kidnapers accepted ransoms of  $\$x/2$  since I don't have the relatively good fortune of dealing with a kidnapper who demands  $\$x/2$  but am stuck with one who demands  $\$x$ ”. This is based on the theory that “market price” is irrelevant to a bilateral monopoly as there is no market but only a series of discrete one-off transactions. In the absence of substitutability, “comparable” transactions are irrelevant. The view articulated does, however, accept that there is an issue of information asymmetry in that the hostage's party has much better information on its assets than do the pirates and so the pirates may be sceptical of the hostage's party pleading poverty.

The following premises may help better explain the process:

- Lack of complete information makes the pirate bargaining dissimilar to the simple case of bilateral monopoly. This lack of complete information exists not only for the pirates but equally for the ship owners.
- ZOPA is variable as the value of the commodity varies over time. At first look, the ZOPA narrows over time as the costs of the pirates rise (to guard and take care of the hostages) and the value of the ship for the owner depreciates.
- Taking a broader view, the ship and the hostages may be seen as separate as far as the bargaining is concerned. As far as the ship is concerned, the ship owners lose money every day in case of prolonged negotiations causing unavailability of their vessels for charter. The deterioration in the condition of the ship over time itself also affects this depreciation over time. From the point of view of the hostages, the owners would face increasing pressure (political as well as from the hostages' families) over time to reach an agreement. If a hostage is killed or injured, the vessel owner or the shipping company may have to, in some countries, stand trial or be sued. Similarly, the pirates would be willing to accept a lower ransom if they are convinced that a higher payment is not forthcoming.

- The hidden costs, over and above the ransom, have to be factored in. As per one estimate,<sup>8</sup> “The professional negotiators, acting on behalf of the ship owners, get about \$100,000 for their services and the lawyers receive a fee of about \$300,000 for ensuring that the shipping companies are not putting themselves in any dubious positions”. The cost of transferring the ransom (This may involve up to two aircraft) and interests on any loans also have to be factored in.

A detailed study<sup>9</sup> on the negotiation process by EUSECON (European Security Economics), a research project supported by the European Commission’s Seventh Framework Programme, is another study that uses game theory-based examination of the premises outlined above. The first thing that determines the final ransom paid, is not the initial demand or even what the ship owner is willing to pay, but rather what the pirates are willing to accept. What they “accept” is certainly linked to what they “expect”. Let us therefore first assume that there is a “going rate” or in other words a reference level ( $RL_P$ ) that is used as a benchmark by the pirates. Any ransom  $R > RL_P$  would be considered satisfactory and the hostage situation satisfactorily terminated. A ransom  $R < RL_P$  would be considered unsatisfactory and may result in further negotiations. A number of factors can determine what the  $RL_P$  is in any situation. The tonnage and age of the ship, cargo carried and the flag state are the most obvious. In addition, the number and nationality of the crew is an important factor. Crews from rich nations are also likely to fetch a higher ransom.<sup>10</sup>

In addition to these factors, as far as the pirates are concerned, the primary factor would be the cost incurred by them in capturing the ship. Let us call this the cost of operations or  $C_o$ . This would include not only the readily measurable monetary costs (pay per pirate, cost of weapons, operating costs for the mother ship, cost of skiffs and outboard motors, communication equipment, provisions) but also the other factors such as failed attempts, pirates arrested or killed in naval operations etc. The anti-piracy measures including those by naval forces, private security companies and the Best Management Practices followed by ships, also therefore contribute to the enhanced  $C_o$  from the viewpoint of the pirates. Since all of these would reduce the success rates and not every mission may culminate in a successful capture of a ship, the  $C_o$  may actually be the cumulative cost of many missions.

From the perspective of the ship owner, the primary factor determining what is offered would be the value of the ship ( $v$ ). This value is again not fixed and is difficult to quantify. We assume that the value  $v$  is the initial value, which will depreciate over a period of time as the cargo may perish, the ship may suffer material deterioration due to lack of maintenance etc. For each time period  $t$ , the value depreciates by a factor  $\theta$ .

As the negotiations progress, the costs for both the players go up over time. The pirates have to pay not only for sustenance of the crew but also for guarding them and the ship as well. Negotiations themselves cost money. The ship owner similarly loses not only charter income from the ship, but also pays interest on any loans that may have been taken and spends money on conduct of the negotiations. Let  $C_p$  and  $C_s$  be the per-period cost of prolonging negotiations for the pirates and ship owner, respectively. Furthermore, in addition to these costs, both parties would be keen on solving the impasse quickly due to the risks associated with prolonged negotiations, some of which may become critical. The expected payoffs must be discounted by a factor that is indicative of these risks, as for example the pirates' ability to retain control of the vessel in face of threats by rival gangs or the ship owner's time-to-insolvency considerations would be included in this. Future payoffs are accordingly discounted by a factor  $\delta_p$  by the pirates, and by a factor  $\delta_s$  by the ship-owner, both of which may vary between (0,1).

During the negotiations, both players bargain as per a sequence of alternating offers. If the pirates make the initial offer, the ship owner would make a counter (lower) offer after a time-unit. The third offer would be made by the pirates,<sup>11</sup> fourth by the owner and so on. In each period  $t = 1, \dots, \varphi$ , a ransom offer,  $R_t$ , is thus made, and is either accepted or rejected.<sup>12</sup> The instantaneous payoff from accepting offer  $R_t$  at time  $t$  is therefore:

$$\pi_{pt} = R_t - RL_p - C_o - tC_p \quad \text{for the pirates}$$

and

$$\pi_{st} = \theta^{t-1} v - R_t - tC_s \quad \text{for the owners.}$$

This sequence of offers would end with an offer being accepted. If the negotiation continues until the final period ( $t = \varphi$ ), and the final offer is rejected the pirates still

have the ship, which has some intrinsic value (it could for example be used as a mother ship in future expeditions). The payoff in such a case will therefore be the present value ( $V_p$ ), with  $V_p > 0$ . The ship owners will similarly be able to recover some amount through an insurance claim ( $V_1$ ). The terminal payoffs are therefore

$$\Pi_{p\varphi} = V_p - RL_p - C_o - \varphi C_p \text{ for the pirates}$$

and

$$\Pi_{s\varphi} = V_1 - \varphi C_s \text{ for the owners.}$$

The final outcome of the bargaining when an agreement is reached is given by a ransom  $r$ , and a duration  $d$ . The prediction of these using game theory is given by the sub-game perfect equilibrium of the game. This may be found by backwards induction from the last period. If the ship owner moves last<sup>13</sup> ( $t = \varphi$ ), the pirates must be offered at least  $V_p$ , so  $r\varphi = V_p$ . For any other value of  $t < \varphi$ , the equilibrium requires that the offer made must equal an amount such that the other player is indifferent to accepting the offer immediately and accepting a counter offer after a one-period delay. Hence the sequence of offers of the pirates satisfy

$$\theta^{t-1}v - R_t - tC_s = \delta_s(\theta^t v - R_{t+1} - [t+1]C_s) \quad t = 1, 3, \dots, \varphi - 1.$$

The offers of ship owners similarly satisfy

$$R_t - RL_p - C_o - tC_p = \delta_s(R_{t-1} - RL_p - C_o - [t-1]C_p) \quad t = 2, 4, \dots, \varphi - 2.$$

Since both the players suffer diminishing payoffs as the time progresses, the mathematical solution of such a game under conditions of *complete information* would be predicted to end after the first offer ( $d=1$ ) and has no bearing on negotiation length. The fact that this is practically not observed to be true is reflective of the fact that both the parties are negotiating with incomplete information, which changes the very dynamics of the game. It is therefore important to analyse how the information is incomplete and the effect on the negotiation process.

The pirates may be classified as “amateurs” or “sophisticated”. The former are opportunistic and do not have the complex support infrastructure (including

shore-based support infrastructure) that the gangs of sophisticated organized crime syndicates do. Obviously, the cost involved in the operations, the expected payoffs as well as the time that they can prolong the negotiations are higher in the case of sophisticated pirates. The owners may similarly be classified as “rich” or “poor”, ranging from big shipping companies to owners of small fishing trawlers. Except in the case of well known shipping companies, it would benefit the owners to pretend to be poor and plead lack of funds. The pirates would similarly pretend to be sophisticated. The time for which amateur pirates can engage in negotiations ( $\varphi_a$ ) is small compared with  $\varphi_s$  for sophisticated pirates. If  $\delta_s$  is sufficiently high, the ship-owner would extend the negotiations so as to reveal the pirate’s type. Amateur pirates in such cases would give in and accept a lower ransom. If the negotiation extends further, the information asymmetry becomes one-sided. The owners know that the pirates have the capability to extend the negotiations while the pirates still do not know the owner type with certainty. In such a case, it would be in the owners interest to end the negotiations quickly, thus resulting in a higher ransom being paid. The owners incapable of doing so must wait until the time the pirates are convinced of their inability for the ransoms to dip again – thus leading to a hump-shaped curve when plotting the ransom against time.

Whilst the study cited above captures the dynamics of a pirate negotiation well from the point of view of the ship, the process of trying to game the situation from the point of view of the hostages is slightly more complicated. In extending the negotiations, which may be the logical course of action for certain pirate/owner category, the agony of the hostages or the family members is overlooked. In addition, there is always the danger that the hostages may die in captivity or indeed be killed by the pirates in cases where their demands are not met. This has been covered below using a simple model developed by Reinhard Selten in 1976. While the original model dealt with a kidnapping scenario with the danger of the kidnapper being identified by the hostage leading to the eventual arrest being modelled against the threat of killing the hostage, it can be suitably modified to the pirate ransom situation. The game has been kept simple with a minimum number of variables in order to try and understand the responses of the pirate if the expected ransom is not forthcoming despite prolonged negotiations.<sup>14</sup> The game would include the pirates (P) and the ship-owners (S). It is assumed that the negotiation process has reached a

stalemate where S is willing to pay a ransom amount  $C$ , while P demands a minimum sum  $D$ .

For the stalemate to continue,  $C < D$

The pirates would have incurred some costs for the operation and this would determine the ransom  $D$  demanded by them. They would likely threaten to kill the hostages if the demand is not met. While they have nothing to gain from killing the hostages, they may carry out the threat to make their subsequent threats credible.<sup>15</sup> Let us quantify the probability of their carrying out the threat as  $\alpha$ .

If  $C=D$ , the probability is the minimum  $\alpha = 0$

If  $C=0$ , the probability is the maximum  $\alpha = 1$

For the sake of simplification, we assume that  $\alpha$  can thus be described as a linear function ( $C/D$ )

$$\alpha = a[1 - (C/D)] \text{ for } 0 \leq C \leq D \quad (1)$$

where  $a$  is a constant such that  $0 < a < 1$ .

Other than non-rational execution of threats due to factors such as frustration,<sup>16</sup> the decision to carry out the threat can be modelled on a binary decision variable  $e$  such that

$e = 0$ , when the offer  $C$  is accepted and the hostages released

or

$e = 1$ , when the threat is executed.

It is assumed that the killing would lead to some negative publicity for the pirates and may result in international action against them being intensified. We quantify the probability that action against the pirates would be intensified as  $q$  such that

$$0 < q < 1.$$

Even though it would be difficult to quantify the payoffs in such a scenario, we assume that an action would not be undertaken unless there was something to be

gained from it. We therefore assign positive constants  $w$ ,  $x$ ,  $y$  and  $z$  to the payoffs for different situations without attempting to quantify them other than the primary assumption that they are all positive. The payoffs for the adversely affected player would be denoted with a negative sign. For example in the eventuality that the hostages are executed the payoff for the owners is  $(-w)$  regardless of what happens to the pirates thereafter. If the hostages remain alive though the ransom offered is not accepted, the payoff for the owners is still negative  $(-v)$  though  $(v < w)$ , as there may still be hope for subsequent release or rescue. The pirates will also suffer a negative payoff  $(-x)$  in such a scenario, which they must weigh against the possible benefits of keeping the hostages alive (possibly for use as a human shield or crew for mother ships as has also been observed on some occasions). If the hostages are executed and yet the pirates are not subject to any additional action, the pirates gain, thus  $z \geq x$ . The expected payoffs are tabulated below:

Outcome	Payoffs	
	Pirates (P)	Ship-owners (S)
Release of hostages on accepting $C$	$C$	$-C$
Status quo	$-x$	$-v$
Execution of hostages, international action against pirates remains same	$-y$	$-w$
Execution of hostages, international action against pirates intensified	$-z$	$-w$

The same can be modelled as an extensive game with perfect information, wherein at every point the players know the complete previous history leading up to the event. The “optimal” choices may be calculated if we can uniquely determine an equilibrium point in any situation.

*Optimal Choice of “e”*

For the sub-game that begins with the pirates deciding to carry out the threat, let the payoffs be  $K_1$  and  $K_2$  respectively for “not killing” or “killing” the hostages.

$$K_1 = (1 - q)C - qx$$

$$K_2 = -(1 - q)y - qz.$$

Since  $C \geq 0$ ,  $y > 0$ ,  $z \geq x$  and  $(0 < q < 1)$ , we have  $K_1 > K_2$  in all conditions. Therefore, the option of “not killing” is always the rational choice and  $e = 0$  is the optimal solution.<sup>17</sup>

### *Optimal Choice of “C”*

For the sub-game that begins with the ship-owners choice of  $C$ , even if player  $S$  realizes that  $P$  will choose  $e = 0$ ,<sup>18</sup> the probability of the pirates carrying out the threat is still  $\alpha$ . The expected value of his utility would be:

$$U = (1 - \alpha)(1 - q)C - \alpha w$$

Substituting the value of  $\alpha$  from Equation (i) and rearranging terms in quadratic function<sup>19</sup> of  $C$

$$U = \{-a(1 - q)/D\}(C)^2 + \{[aw/D] - (1 - a)(1 - q)\}(C) - aw.$$

In order to determine the optimum value of  $C$ , we compute  $\delta U / \delta C$

$$\delta U / \delta C = \{-2a(1 - q)(C/D)\} + \{[aw/D] - [(1 - a)(1 - q)]\}$$

This assumes the maximum value

$$C = w/[2(1 - q)] - D[(1 - a)/2a] \text{ if } C \text{ is in the interval } 0 \leq C \leq D.$$

We next take the two critical values of  $D$ , with values  $D_1$  and  $D_2$  such that,

$$D_1 = aw/(1 + a)(1 - q) \text{ and } D_2 = aw/(1 - a)(1 - q).$$

For  $D < D_1$ , the derivative  $\delta U / \delta C$  is positive in the interval  $(0 \leq C \leq D)$ . For  $D > D_2$  the derivative  $\delta U / \delta C$  is similarly negative in the given interval. In this case, the optimal value of  $C'$  becomes

$$\begin{aligned} &= D && \text{for } 0 < D \leq D_1 \\ &= w/[2(1 - q)] - D[(1 - a)/2a] && \text{for } D_1 \leq D \leq D_2 \\ &= 0 && \text{for } D \geq D_2. \end{aligned}$$

In simple terms, with an increase in the ransom demanded  $D$ , the optimal offer  $C$  first increases up to  $D = D_1$  and then decreases until it becomes 0 at  $D = D_2$ . Up to the lower critical value  $D_1$ ,  $S$  eliminates the danger to hostages by yielding to the demands of  $P$ . In the interval between  $D_1$  and  $D_2$ , the probability of the pirates carrying out the threat  $\alpha$  is diminished with additional money  $C$ , with the change being lesser for higher values of  $D$ . After the higher critical value  $D_2$ , influence on  $\alpha$  is so small that it appears useless to offer anything at all and the negotiations are likely to be terminated.

### *Optimal Choice of “D”*

We next look at the sub-game that begins with the pirates’ choice of  $D$ . If the pirates know that the player  $S$  will select their offer optimally and that later they themselves will choose  $e = 0$ , the payoff expectation may be calculated under these conditions. We have seen that the payoff as a function of  $D$  increases up to  $D_1$  and then decreases up to  $D_2$ . It therefore follows that the optimal value of  $D$  would be at  $D_1$ . Player  $P$ ’s optimal demand would be when the optimal offer coincides with the demand or when

$$D' = aw / (1+a)(1-q).^{20}$$

## **Observations and Policy Recommendations**

It may therefore be seen that both the ship and the hostages are amenable to being used for bargaining though the modalities governing the negotiation process are different. In case of prolonged negotiations, as the cost of the pirates mount, there are often disagreements between the pirates on the course of action. Jon Lee, an analyst for Compass Risk Management Company, which has been involved in negotiations to free ships and crew, said “Pirates treat the crew and the ship as commodities and they have a very businesslike attitude about ransoms and hostages”.<sup>21</sup> In one case the crew and the ship were split as the “financier” refused to release a part of the crew even when the ship had been ransomed. “In this case, the commodity has been split between different gangs. Each group will be looking at how much the other got. The first group does not want any other group to get more than they did and the amount they obtained will govern and influence how much the rest ask for”.<sup>22</sup>

It has often been stated that piracy off Somalia is on the decline. This is apparent by the number of attacks over the last few years. The decline is attributed to a number of factors including patrol by naval forces, adoption of Best Management Practices, presence of private security companies etc. From the purely economic viewpoint, this apparent decline is arguable, as only statistical figures indicating a decline in the number of successful or attempted attacks over a period may be insufficient to conclude effectiveness of these measures unless a consequent decline in the “profits” is also observed. The measures indicated certainly act as deterrents in that they increase the  $C_o$  for the pirates. If they do not succeed sufficiently in checking even the isolated success rates, the failed attempts just go into increasing the  $RL_p$  for the subsequent ransoms thereby driving them up. One large successful attempt may economically be a better option for the pirates, than a number of smaller ones. There is no doubt that the number of incidents has declined in 2012. The reasons for the same, however, may be other than those claimed, and the economic model continues to be in place. About the reasons for the decline, IHS Jane’s quoted<sup>23</sup> EUNAVFOR officials as stating, “We’re not really sure why that is – we would like to think that we’re doing something right and that the navies have had some effect on that. However, there are other factors at play: do they have just enough money? Is there something else going on in Somalia? We’re really not sure, although we hope we’ve at least had some effect on it.” The realization that the effect may be due to simple economic considerations is also there,

*So this [statistic] needs to be taken with a grain of salt. We think that possibly one of the factors in the different pirating activity was the fact they were so busy focusing on getting money for the ships they had...they basically ran out of capacity to hold onto ships, so they focused on ransoming them, getting the money and then once they got rid of their current inventory they could go about finding new inventory.*

The question that must be answered is whether these “deterrents” have ceased to have a deterrent effect. In addition to driving the ransoms up they also place the governments/ship-owners in a scenario where the costs are incurred even when there is a decline in the number of attempts. Since higher past ransoms are positively associated with subsequent ransom amounts, they also impart a negative externality

on future victims. This in effect means a catch-22 situation where while these actions were ineffective to begin with, their termination would make things even worse. In such a scenario, the incidents as well as the ransoms would see an upward trend.

It is also important to note that ransom durations have lengthened as pirates have developed the land-side infrastructure needed to protect and supply ships for long periods. If the finding that sophisticated pirates extract higher ransoms than amateur is true, the increase in the ground-based infrastructure to sustain long negotiations means that the negotiations will progressively be longer and the ransom higher. The decrease in the number of incidents notwithstanding, the effect of piracy continues to grow from the pirates' perspective.

The pirates have also shown a remarkable ability to adapt to the changes brought about by new security measures. While the presence of armed security guards has been quoted as one of the reasons responsible for the decline in piracy, it needs to be examined further. The pirates have shown themselves to be risk averse, as is also shown by the decline in piracy incidents in the monsoon months. If there are enough ships available without the armed guards, it makes little sense to escalate the level of violence by engaging in a direct fight with the guards. This explains why not a single ship with guards has ever been attacked. The presence of guards on all ships may, however, result in the pirates having no option but to escalate the level of violence. This enhanced "cost" may also result in a consequent increase in the  $RL_p$  for ransom. The situation is akin to the pirates being forced to expand their area of operations based on the establishment of the international transit corridor. The change of tactics, necessitated by the security forces action, resulted in the use of mother ships and spreading the menace, which had been a limited phenomenon until then.

It has been advocated that control of piracy can only be achieved by action on land. The conditions in Somalia where there is complete anarchy and the lack of other alternatives is cited as the reason for the former fishermen taking up piracy. Even if this view is accepted, it is doubtful whether creation of jobs/infrastructure ashore will result in cessation of piracy. It must be acknowledged that anarchy does not favour piracy, as the capacity of the pirates to prolong negotiations is directly affected. Also, areas in Somalia that are relatively well governed have higher rates of support to piracy. While the country may not have a formal governance structure, the informal economy has been doing reasonably well, at least in the piracy-affected areas.

The change in economic conditions must therefore be seen as being independent of the piracy phenomenon.

The likelihood of the pirates rationally killing any of the hostages is almost nil. The only reported case of negotiations breaking down so as to involve killing as a threat was when Somali pirates who have been holding a hijacked ship for nearly 2 years reportedly killed a Syrian crew member<sup>24</sup> and wounded another to protest delayed ransom payment. Hassan Abdi, a pirate commander in Haradhere town, a key pirate centre, said that the killing was a message to the owners of the ship MV Orna that was hijacked off Seychelles in 2010 adding “More killings will follow if they continue to lie to us – we have lost patience with them. Two years is enough.” This was subsequently found to be untrue. As per Abdul Kadar, technical adviser to Sirago Ship Management, which handles operations for Kasaab Intershipping, a company registered in the Marshall Islands, “It was a rumour but no one has been killed”.<sup>25</sup> He added that the freed crew and the pirates had confirmed that all 19 crew members were still alive, though six crew member had not been released due to differences between the pirates. Other killings may have been as reprisal for attacks on the pirates by a particular country (for example the reported killing of four American hostages<sup>26</sup>). Since two dead pirates were also found on the yacht, it is more likely that the killing was accidental or during a failed attempt to overpower the pirates by the hostages. The attempt to spread fear using mind games is, however, apparent. Two Somali pirates who spoke with Reuters by telephone said the hostages were ordered killed since the pirates themselves were under attack by US forces. “Our colleagues called us this morning, that they were being attacked by a US warship,” Mohamud, a Somali pirate, told Reuters. “We ordered our comrades to kill the four Americans before they got killed.” Similarly, some Indian crew members’ hostage ordeal is being prolonged reportedly in retaliation for the arrests of more than 100 Somali pirates by the Indian Navy.<sup>27</sup> This may also be a ploy to cash in on the information asymmetry, as other Indians on the same ship were released.

Based on the above, the policy recommendations that emerge are summarized in the succeeding paragraphs.

- The role of the Government should be largely passive in the negotiation process as active involvement changes the information advantage in favour of the pirates – the owners can no longer claim to be poor. If the governments

cave in to the political pressure, the ransom is likely to be comparatively higher. For instance, “under political pressure to recover hostages, the Spanish government paid 1.2 million USD in 2008 for release of the Playa del Bakio, more than twice the previous record amount for a fishing vessel”.<sup>28</sup>

- Since the safety of the crew can be assumed, prolonging the negotiations to help identify the amateur gangs from the sophisticated may be an option. Government involvement to help facilitate this aspect may be considered.
- The “Catch and Release” policy being followed by certain countries does not appreciably raise the  $C_o$  whilst still increasing the expected ransom. This may therefore be more harmful than no action.
- The need for cooperation amongst countries, especially in offensive actions, is apparent. This would not only prevent crew members from a particular country being specifically targeted but also substantially increase the  $C_o$  for the pirates.
- Escalation or threat of escalation in the action against pirates is the only credible factor to lower the menace. The action by Indian Navy in controlling the spread of piracy close to Indian shores is one example of proactive action being the optimum solution. Action to target shore-based logistics support depots immediately after an act of piracy may provide one option for raising the “cost” for the pirates. Most countries are reluctant to get involved “on ground” in Somalia; however, targeting infrastructure close to a coast that may not involve human life may be an option.

## Conclusion

Capt Mukundan of IMB has pointed out that most piracy-related costs are recurring in nature:<sup>29</sup>

*What we [at IMB] believe is that a lot of action has been taken already at sea against the pirates. The report by the One Earth Future Foundation in 2011 estimated that last year the economic cost of piracy was between USD6.6 billion and USD6.9 billion. What is significant is that they estimated that 80 per cent of this cost is a recurring cost which we can expect to incur next year, the year after*

*and so on. So we have reached the stage where we need to have a game changer, otherwise we can expect to carry on at the similar levels of piracy for years to come.*

The need to seek changes to the current model to ensure that his grim prediction does not come true will need international cooperation and resolve to stop the menace. Targeting the economic model that supports piracy may be one, and possibly the only, long-term action.

## Notes

1. Roger B. Myerson, *Game Theory: Analysis of Conflict* (Cambridge, MA: Harvard University Press, 1991), p. 1. Chapter-preview links, pp. vii–xi.
2. The closest Somali translation for pirates is “ocean robbers” (“burcad badeed”). Somali pirates prefer to call themselves “badaadinta badah” – “saviours of the sea”: the movement started when Somali fishermen decided to react against illegal fishing and toxic dumping in Somali waters. However, the same is irrelevant as over time the problem has moved on from fishermen “gathering taxes” from foreign vessels to a highly organized hostage taking business. It may be seen that fishing vessels though easier targets are no longer the preferred choice of targets. See also Stig Jarle Hansen, “Debunking the Piracy Myth: How Illegal Fishing Really Interacts with Piracy in East Africa”, *RUSI Journal*, 156 (December 2012): no. 6.
3. S. Cohen, *Negotiating Skills for Managers* (New York: McGraw-Hill, 2002).
4. Adapted from Raiffa et al., 2002.
5. Prolonged negotiations in each individual act of piracy may be considered “mutually hurting” due to factors discussed subsequently. Piracy as a whole is not hurting the pirates and the situation is therefore not “ripe for resolution”. It has also been opined that the situation is also not hurting the governments and ship-owners. See for example Sam Bateman, *Sea Piracy: Some Inconvenient Truths* (Geneva: UNIDIR, 2010).
6. Megan McArdle, Kidnapped by Pirates at Sea? Here’s How Economics Can Save You, *The Atlantic*, 2012, <http://www.theatlantic.com/business/archive/2012/05/kidnapped-by-pirates-at-sea-heres-how-economics-can-save-you/256828/> (accessed 12 January 2013).
7. Ibid.
8. <http://news.bbc.co.uk/2/hi/africa/7752813.stm> (accessed 15 February 2012).
9. Olaf J.de Groot, M.D. Rablen and A. Shortland, “Barrgh-gaining with Somali Pirates”. Economics of Security Working Paper 74 (Berlin: Economics of Security, 2012).
10. Ibid. In the study, the GDP of the country for each crew member is used as a proxy for determining the reference value for the crew. “At the extremes, the lowest value is found for

the ten crew members on board the Kenyan-owned MV Miltzow captured in 2005 and the highest is found for the 30 crew members of the French-owned MV Le Ponant”.

11. The offer of the pirates would be expected to progressively come down as the previous higher offers are rejected. The attempt would be to make the owners increase their offers so that an agreement can be reached.
12. The actual negotiation process may deviate from this strict alteration. The fact that the lower or higher of two simultaneous offers may be taken as indicative ensures that negotiation will, in essence, be a series of alternating offers.
13. The study by EUSECON used as the basic reference for this paper states that if the pirates are assumed to move last, the offer should equal  $V_1$ , so  $r\varphi = V_1$ . It is asserted by the authors that “Our results are qualitatively unaffected by who makes the final offer, but quantitatively, there is a benefit from being the last mover”. This view is debatable. Though mathematically accurate, the statement probably does not take into account the lives of the crew held as hostages. If the offer equalled what could be claimed from insurance, and simultaneously resulted in release of the hostages, the owners would accept it without any hesitation. Such a solution, calculated purely on the basis of the ship’s value balanced with the amount due from insurance may still be realistic in case the hostages have died due to whatever circumstances during the period of negotiation.
14. In this case, it is assumed that the value of the ship has reached its lowest value due to the depreciation and only the hostages are in effect being bargained for. This assumption is an oversimplification not to be taken literally.
15. This is unlikely in a scenario where there are multiple pirate gangs and different ship-owners. It is therefore strictly relevant only in case of a repeated game between the same set of players. However, the effect of killing one set of crew on the negotiation by other owners cannot be discounted.
16. Violent reaction to an unsatisfactory offer may result from an urge to take “revenge” on the hostages. This would be in line with the well known frustration aggression hypothesis. This, however, has a low probability in a situation under consideration and may be more applicable to a terrorist hostage situation/kidnapping.
17. This will also be intuitively apparent by asking the question “What would the pirates gain by killing the hostages?”
18. It is logical to assume that S will work on this premise. If this were not the case, the owner would be willing to pay up to the maximum amount limited only by availability of funds.
19. This is a quadratic function of the form  $(ax^2 + by + c)$ . If the same is taken as representing a concave quadratic function, the optimum value would be the inflection point on the curve.

20. Accordingly, it may be seen that the aim of the policy makers must be to decrease the incentives to engage in acts of piracy. This may be achieved by a decrease in  $a$  or  $w$  and by an increase in  $q$ .
21. [www.thenational.ae/news/uae-news/six-mv-orna-crew-still-held-by-pirates#ixzz2LzHsqwPy](http://www.thenational.ae/news/uae-news/six-mv-orna-crew-still-held-by-pirates#ixzz2LzHsqwPy) (accessed 10 February 2013).
22. Ibid.
23. IHS Jane's report, Ship to shoreline: EU NAVFOR expands its anti-piracy mission, 2012.
24. [http://www.huffingtonpost.com/2012/09/01/somali-pirates-hostage-killed\\_n\\_1848937.html](http://www.huffingtonpost.com/2012/09/01/somali-pirates-hostage-killed_n_1848937.html) (accessed 13 February 2013).
25. [www.thenational.ae/news/uae-news/six-mv-orna-crew-still-held-by-pirates#ixzz2LzL3bXpC](http://www.thenational.ae/news/uae-news/six-mv-orna-crew-still-held-by-pirates#ixzz2LzL3bXpC) (accessed 10 February 2013).
26. [http://www.nbcnews.com/id/41715530/ns/world\\_news-africa/#.USxbOX1xiRs](http://www.nbcnews.com/id/41715530/ns/world_news-africa/#.USxbOX1xiRs) (accessed 13 February 2013).
27. <http://www.thehindubusinessline.com/industry-and-economy/somali-pirates-continue-to-keep-indian-hostages-despite-ransom/article1701331.ece> (accessed 13 February 2013).
28. Olaf J.de Groot et al., *ibid.*
29. *Ibid.*