Bank of Israel **Research Department**

Targeted Killings: Evaluating the Effectiveness of a Counterterrorism Policy[1]

by

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Abstract

targeted killing (henceforth assassination) of members of Palestinian terrorist organizations was a major element in Israel's counterterrorism effort during the Palestinian uprising which started in 2000. We evaluate the effectiveness of this policy indirectly by examining Israeli stock market reactions to assassinations. Our approach relies on the assumption that the market should react positively to news of effective counterterrorism measures but negatively to news of counterproductive ones. The main result of the analysis is that the market reacts strongly to assassinations of senior members in Palestinian terrorist organizations: it declines following attempts to assassinate political leaders but rises following attempts to assassinate military ones.

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I. Introduction

Since September 11, 2001 terrorism has been at the center of world attention. The attacks on the World Trade Center and the Pentagon are widely perceived as the beginning of a new era of terrorism. Other countries have also suffered heavily since then at the hands of terrorists. The severity of these attacks naturally resulted in enhanced efforts to find effective ways of combating terrorism.

One of the most controversial counterterrorism policies is that of assassinating members of terrorist organizations.[1] The policy of assassinations is controversial for several reasons. One objection to it is legal: the argument is that assassinations are extra-judicial executions. Another objection to the policy is moral and focuses on the possibility that assassination attempts will hurt noncombatants. The third objection to assassinations is based on the claim that they are ineffective, or even worse, counterproductive: they might ultimately result in increased terrorism. This paper offers a unique quantitative analysis of the effectiveness of assassinations. In order to do so it focuses on Israel, a country that has been suffering from terrorism for years.

The terrorist attacks against Israelis have intensified since the outbreak of the *Al-Aksa* (or second) *Intifada* at the end of September 2000.[2] Figure 1 displays the number of Israeli civilians killed in Palestinian terrorist attacks from September 29, 2000 to the end of April, 2004. In total, close to 600 Israeli civilians were killed in Palestinian terrorist attacks during this period.[3] Israel has responded to the terrorist offensive in various ways, including attempts to assassinate members of Palestinian terrorist organizations.

The *Al-Aksa Intifada* is not the first time Israel has employed assassinations as a policy instrument. In the past assassination targets included Egyptian intelligence officers involved in orchestrating infiltrations into Israel in the 1950s, German scientists developing missiles for Nasser's Egypt in the 1960s, Palestinian terrorists involved in the

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[1] Assassination is commonly defined as the murder of an important person in a surprise attack for political reasons. In the context of counterterrorism other terms, such as "pinpoint killing" or "targeted killing", are sometimes used to describe the same phenomenon.

[2] For analysis of Palestinian terrorism in recent years, and particularly of the use of suicide bombings, see Ehud Sprinzak (2000), Gal Luft (2002), Bruce Hoffman (2003), and Robert A. Pape (2003). For a brief historical overview of Palestinian terrorism see Walter Laqueur (2003).

[3] Two thirds of the victims were killed in attacks that took place within Israel's 1967 borders. The others were killed in the Occupied Territories. Source: B'tselem, the Israeli Information Center for Human Rights in the Occupied Territories.

1972 Munich Olympics attack, and senior leaders of Palestinian and other terrorist organizations such as Khalil al-Wazir (Abu Jihad), the deputy chairman of the Palestinian Liberation Organization (Tunisia, 1988), Abas Musawi, the secretary general of Hizbullah (Lebanon, 1992), Fathi Shkaki, the head of Palestinian Islamic Jihad (Malta, 1995), and Khaled Mashaal, a senior Hamas leader (Jordan, 1997). It is widely believed that the Israeli Defense Forces planned to assassinate Saddam Hussein after Iraq attacked Israel during the Gulf War of 1991. The plan was scrapped following the death of several soldiers in a 1992 training exercise.[4]

Two important characteristics distinguish between the assassinations carried out since September 2000 and the previous ones. First – frequency: previous assassinations were rare events. In contrast, since September 2000 Israel has carried out more than a hundred assassination attempts. Second – importance of the targets. The fact that Israel has carried out so many assassination attempts during the *Al-Aksa Intifada* necessarily means that a large share of the targets were of relatively low rank.

The effectiveness of assassinations as a counterterrorism policy has been the subject of a fierce debate in Israel.[5] The debate focuses on the impact the assassinations have on the capabilities and the motivation of terrorist organizations. The two sides to the debate seem to agree that the production of terrorism is positively related to both capabilities and motivation.[6] There is disagreement, however, on the magnitude of the effects of assassinations on capabilities and motivation and therefore on the production of terrorism.

Most analysts agree that the assassination of a terrorist hurts his organization's capabilities. Assassinations work to disrupt the preparation of terrorist attacks by the individuals targeted and make other members of the terrorist organizations spend valuable time and resources in guarding themselves. The threat of assassination may deter a terrorist from carrying out further attacks and has the potential of hurting his organization's recruiting efforts. With regard to motivation, most observers agree that

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[4] These and other assassination attempts and plans are described in Dan Raviv and Yossi Melman (1990), Ian Black and Benny Morris (1991), Carmi Gilon (2000), Moshe Zonder (2000), Gad Shimron (2002), and Amos Harel and Avi Isacharoff (2004).

[5] Steven R. David (2002), Shlomo Gazit (2002), Shmuel L. Gordon (2002), Boaz Ganor (2003) and Gal Luft (2003) offer qualitative analyses of the issues raised in the debate.

[6] Motivation should be thought of as willingness to employ capabilities to carry out terrorist attacks.

the assassination of a terrorist may increase the motivation of other members of his organization (and possibly of the wider population) to carry out attacks.[7]

The broad agreement on these basic analytical issues notwithstanding, two crucial distinctions should be emphasized with respect to the effect of an assassination on the production of terrorism. First, the magnitude of the effect is likely dependent on the seniority of the target. It is reasonable to assume that an assassination would be most effective in reducing the capabilities of a terrorist organization if the target is a senior leader with specialized knowledge and skills.[8] The assassination of a low rank terrorist, in contrast, is not likely to seriously disrupt the operation of his organization. It is also reasonable to assume that the assassination of a low rank terrorist, unlike that of a more senior leader, will generate little increase in the motivation of his organization to carry out attacks.

The second crucial distinction is that between members of the political and military wings of terrorist organizations.[9] Military leaders are involved in planning operations, and recruiting, training, arming and dispatching terrorists. Thus the assassination of a military leader has the potential of severely disrupting his organization's terrorist operations. Senior political leaders, in contrast, are primarily responsible for political and spiritual guidance. Thus it is possible that assassinating a senior political leader is less likely to significantly decrease the operational capability of his organization.

Relative to a senior military leader, however, attempts to assassinate a senior political leader would tend to greatly increase the motivation to carry out terrorist attacks. This is due to two factors. First, political leaders are typically far better known to the Palestinian public than military ones. Second, the targeting of military leaders seems to be perceived, by both Palestinian and Israelis, as part of the "rules of the game". In

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[7] The possibility does exist, however, that an assassination or a series of assassinations will lead to a decline in motivation – or demoralization – among the members of a terrorist organization.

[8] Isaac Ben-Israel et al. (forthcoming) argue that one of the key weaknesses of terrorist organizations is their high vulnerability to any action against their leadership. They estimate that the number of key activists in the Hamas is only a few hundred and argue (p. 5) that "one only needs to neutralize 20%-30% of them for the organization's 'production' of acts of terror to drop significantly".

[9] On the structure of Palestinian terrorist organizations see Luft (2003).

contrast, attempts to assassinate political leaders are perceived as crossing a "red line".[10] For these two reasons the assassination of military leaders would tend to evoke less rage and calls for retaliation than the assassination of political leaders.

Summing up, the discussion above leads to several conclusions. First, the net effect of an assassination on the production of terrorism is indeterminate because it embodies two conflicting effects: on capabilities and motivation.[11] Second, the conflicting effects would both tend to be quite small in assassinations targeting low rank terrorists. Third, taking into account the two conflicting effects, the assassination of a senior military leader is more likely than the assassination of a senior political leader to be followed by a decrease in the production of terrorism.[12]

The debate within Israel on the effectiveness of assassinations has been raging for years. Yet, very few attempts have been made to date to substantiate either position by a quantitative analysis. The fact that Israel has resorted to assassinations so frequently since September 2000 allows us to address the effectiveness question econometrically.

The empirical literature on counterterrorism (which we briefly survey in section III) has up to date focused on measuring the direct effect of counterterrorism efforts on the production of terrorism. This has typically been done by comparing the number of terrorism incidents of certain types before and after the implementation of various counterterrorism policies. However, it is our view that the direct approach is not readily applicable to the analysis of the Israeli assassinations of Palestinian terrorists during the *Al-Aksa Intifada*. A major difficulty in applying this approach is identifying the reaction functions of Palestinian terrorist organizations to Israeli assassination attempts. One source for the difficulty lies in the fact that Israel has adopted other counterterrorism measures (such as conducting raids into Palestinian cities and villages to arrest terrorism

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[10] A "red line" is a threshold, the crossing of which by an enemy would tend to trigger retaliatory action. In several instances during the *Al-Aksa Intifada* assassination attempts directed at Palestinian political leaders were portrayed by observers (on both the Palestinian and Israeli sides) as crossing a "red line".

[11] B. Peter Rosendorff and Todd Sandler (2004) present a theoretical model that captures the same conflicting effects.

[12] In examining the role of seniority and wing membership we chose to focus on the capabilities/motivation tradeoff because it figures prominently in the assassinations debate in Israel. It has to be emphasized, however, that our aim is to identify the net effects of assassinations and not their separate effects on capabilities and motivation. What is crucial for our analysis is the ability to empirically identify the dependence of effectiveness on target characteristics and not the mechanisms that are behind this dependence.

suspects, setting up roadblocks, and constructing a separation barrier) during the period under investigation. Very little high quality information is available on some of these and other relevant measures. The difficulty in applying the direct approach also stems from the fact that several Palestinian terrorist organizations operate simultaneously but with different goals and from the inability to ascertain whether any given terrorist attack was carried out as a retaliation to an assassination attempt or not. Thus we believe that separating out the effect of the assassinations policy using a direct approach is practically impossible.[13]

We propose an indirect test to evaluate the effectiveness of the assassinations policy. Our approach builds on the fact that terrorism has had a significant adverse macroeconomic effect on Israel, as was demonstrated by, among others, David Fielding (2003a and 2003b), Samer Haj-Yehia (2003), and Zvi Eckstein and Daniel Tsiddon (2004).[14] We rely on this fact and on the forward-looking, information-aggregating nature of the stock market to argue that market reactions to news regarding counterterrorism measures should depend on their perceived effectiveness. In specific we claim that the Israeli stock market should react positively to news of effective counterterrorism measures but negatively to news of counterproductive ones.

Two important points should be emphasized with respect to our reliance on stock market reactions.[15] First, these reactions reflect the perceptions of investors about the expected behavior of the public, both in the short-run and in the long-run. Second, stock market reactions factor in a wide spectrum of potentially relevant repercussions of the

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[13] Two recent studies which attempt to directly examine the effect of Israeli counterterrorism policies on the production of Palestinian terrorism and suffer, in our opinion, from these and other methodological problems are David A. Jaeger and M. Daniele Paserman (2005) and Edward H. Kaplan et al. (2005). The former finds (using our data) that successful assassination attempts reduce Israeli fatalities while the latter finds no such effect.

[14] The adverse macroeconomic effects of terrorism are not limited to Israel. Alberto Abadie and Javier Gardeazabal (2003), for example, offer evidence of such effects in Spain's Basque Country. A recent survey of the economic costs of terrorism is included in Bruno S. Frey et al. (2004). From this perspective terrorism can be seen as a form of economic warfare.

[15] Our approach is close in spirit to the literature on prediction markets. Recent examples from this literature include Andrew Leigh et al. (2003) and Yakov Amihud and Avi Wohl (2004). A review of the literature is offered by Justin Wolfers and Eric Zitzewitz (2004). See also James Surowiecki (2004).

policy, most importantly the possible retaliation by the terrorists and effects on the Israeli-Palestinian peace process.[16]

We implement our approach by conducting a series of event studies, where each event constitutes an assassination attempt. A crucial element in the application of this methodology, which is standard in the economics and finance literatures, is establishing that the examined events indeed constitute "news." We argue that the assassinations carried out by Israel during the *Al-Aksa Intifada* indeed constitute news. This is because Israel's policy of assassinations has always been vague, with no government commitment to continue carrying them out. Indeed, during the *Al-Aksa Intifada* there have been sub-periods in which Israel has refrained from assassinating terrorists. At any point in time the government's intentions and the makeup of the approved list of targets were for the most part unknown to the public. Even in those cases where the name of a potential target is publicly known, there is always uncertainly about the chances of his elimination.[17]

It also has to be emphasized that the assassinations do not reflect the passive response of the Israeli government to changes in the supply of terrorists. It is true that when the Israeli authorities receive new intelligence about an imminent threat they attempt to take immediate action to thwart it, including in some cases assassinating a terrorist. However, our examination of the data points to the fact that the majority of the assassinations, especially of the terrorist organizations' leaders, were carried out either as a response to new intelligence about the whereabouts of a long sought after target (with no new information about his terrorism plans) or as a response to a new government

[16] The fact that stock market reactions capture a very wide spectrum of short- and long-run considerations offers another advantage of our approach over the direct examination of the effects of counterterrorism policies on the production of production.

[17] The appropriate interpretation of the nature of the news is an important question. We focus on a narrow interpretation: a member of a given rank in the political or the military wing of a terrorist organization was assassinated. However, the news may contain much more information. For example, they may lead the public to update on how aggressively the government will continue to pursue the assassinations policy and how successful the government will be at carrying it out. News regarding assassinations should also be interpreted in light of the overall political and military circumstances. For the most part (and, admittedly, at a cost) we are leaving such issues out of our analysis because of the difficulty of quantifying them.

decision to cancel the implicit immunity given to an individual (with no new intelligence about either his location or plans).[18]

The most important result of our analysis is that the reaction of the Tel Aviv Stock Exchange to assassinations depends on the seniority and wing membership of the target. The market does not react to assassinations of low ranked members of Palestinian terrorist organizations. The market does react strongly, however, to the assassinations of senior leaders of terrorist organizations: it declines following assassinations targeting senior political leaders but rises following assassinations of senior military leaders. This implies that the market perceives the first type of assassinations as counterproductive but the second as an effective counterterrorism policy.

In the next section we describe our dataset. We then turn to the empirical analysis. Discussion of our results in the context of the existing literature on terrorism and counterterrorism follows. The final section concludes.

II. Data

Our analysis focuses on the period September 2000 - April 2004. Most of the data on assassination attempts was collected from four sources. The first is a list of assassinations compiled by the Palestinian Human Rights Monitoring Group. This list covers the entire period under investigation and includes 121 events. The second source is a list of "targeted killings" compiled by the International Policy Institute for Counterterrorism in Israel.[19] This list also covers the entire period and includes 78 events. The third source is a list of assassinations compiled by B'tselem, the Israeli Information Center for Human Rights in the Occupied Territories. This list covers the period September 2000 - June 2003 and includes 75 events. The last source is a list of assassinations compiled by the Public Committee against Torture in Israel and the

[18] According to media reports the process that leads to an assassination begins with intelligence gathering by the Israeli Defense Forces, the General Security Services, and the Mossad (external intelligence agency). Feasibility studies are then conducted. Authorization for the operations is typically given by the defense minister and the prime minister. In certain cases the operation is voted upon by the government's security cabinet.

[19] The International Policy Institute for Counterterrorism is an apolitical research institute and think tank dedicated to the study of international terrorism.

Palestinian Society for the Protection of Human Rights and the Environment. This list covers the period September 2000 - January 2002 and includes 49 events.

There is a large amount of overlap in the four lists of assassination attempts (for the period covered in all). Nevertheless, differences among them do exist. The main source of differences seems to be the definition of what exactly qualifies as an assassination attempt. Another difference has to do with the inclusion or exclusion of assassination attempts in which the target survived. Our dataset includes all the incidents that appear in any of the four lists. By adopting this approach we allow the data to determine which events matter.

Data on assassinations obtained from the four sources mentioned above was expanded with the use of media reports. The most intensively used media sources (via the LexisNexis service) were the Jerusalem Post and reports of news agencies, such as the Associated Press. Stock market data were obtained from the Tel Aviv Stock Exchange database, through the Bank of Israel and the Hebrew University of Jerusalem. Data on the timing of events allowed us to assign all events to the appropriate Tel Aviv Stock Exchange trading days.[20]

Table 1 provides descriptive statistics on assassination attempts. During the period from September 2000 to April 2004 there were 159 Israeli assassination attempts targeted at members of Palestinian terrorist organizations. The year 2002 saw the largest number of attempts - 56. More than two thirds of the assassination attempts were carried out in the West Bank and the remainder in the Gaza Strip.

The most frequently used assassination method (employed in 47 percent of the cases) was shooting (light arms) – either from close range or by snipers. In 34 percent of the cases the Israeli Air Force used missiles from attack helicopters. In 14 percent of the cases various explosive devices (e.g. booby-trapped vehicles) were used. Roughly 50 percent of the assassination attempts were targeted at Hamas members, 31 percent at Fatah members, and 17 percent at Islamic Jihad members. The rest were targeted at members of smaller organizations. In 85 percent of the cases the target of the

[20] The Tel Aviv Stock Exchange operates from 8:30AM to 5:00PM local time, Sunday through Thursday, except on holidays. The cutoff time for classification of events was 4:30PM, i.e. events that took place before 4:30PM, Sunday through Thursday, were assigned to the same trading day. Other events were assigned to the next trading day according to the Tel Aviv Stock Exchange trading schedule. For further details on the Tel Aviv Stock Exchange see its website: http://www.tase.co.il/.

assassination attempt was killed. Overall, 317 individuals were killed in assassination attempts, almost 80 percent of whom were combatants.

Two issues are crucial for our analysis: (1) establishing the seniority of each assassination target and (2) the classification of each target into either the political or the military wing of his organization. We adopted two types of measures to establish seniority and to classify targets as political or military: (a) measures based on Israeli media coverage and (b) measures based on expert opinion.

The reason we use Israeli media coverage is straightforward: this is how investors learn about events. In specific we use the coverage in the Israeli English-language daily newspaper, The Jerusalem Post.[21] Although the Jerusalem Post is not a mass circulation newspaper in Israel, one can safely assume that its coverage of assassinations is highly correlated with that of other Israeli media sources.[22]

Using the Jerusalem Post's coverage of assassinations we construct a measure of target seniority based on the following 3 conditions: (1) whether in the day after the assassination it was covered in a front page article;[23] (2) whether in the day after the assassination its target was mentioned in more than one article; (3) whether the name of target was mentioned in the newspaper prior to his assassination (starting from September 2000).[24] We define a target as senior if at least two of the three conditions hold.[25]

It has to be noted that media coverage of an assassination depends on factors other than the seniority of the target. For example, a concurrent major news event may crowd the coverage of an assassination out of the headlines. This is one reason why we also rely

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[21] The Jerusalem Post is the only Israeli daily newspaper available through the LexisNexis service.

[22] For a sample of events we have verified this by comparing the coverage in the Jerusalem Post with that of the Israeli Hebrew language newspaper *Ha'aretz*.

[23] The "day after the assassination" refers to publishing day. The Jerusalem Post is published Sunday through Friday, except for holidays. Thus, for example, events that occurred on a Friday or a Saturday would typically be covered in the following Sunday. It has to be noted that for events that occur during a trading day the reaction of the market cannot obviously be influenced by the following day's coverage in the Jerusalem Post. As was mentioned earlier, however, it is reasonable to assume that the coverage of events is highly correlated across media outlets including radio and online sources which report news almost immediately.

[24] The third criterion has the potential drawback of making it more likely that later assassination targets would be classified as senior.

[25] Using a less restrictive criterion, in specific demanding that only one condition is met, would have resulted in an unreasonable (almost a three-fold) increase in the number of targets classified as senior leaders. Using a very restrictive criterion, in specific demanding that all three conditions be met, would have resulted in an equally unreasonable (almost two-thirds) decrease in the number of targets classified as senior leaders.

on expert opinion. Five experts on the Israeli-Palestinian conflict were asked to rank (on the scale of 1 to 10) the seniority of assassination targets.[26] We use the average score across the five expert rankings to establish seniority. We classify as a senior leader any target with an average rank of at least 2.[27] This resulted in a similar number of targets being classified as senior as that obtained using the media coverage criterion.[28]

To classify the targets of assassination attempts into the political and military wings of terrorist organizations we rely on expert opinion.[29] These opinions differ somewhat and we therefore adopt three approaches to the classification. According to the first, least restrictive approach, the target would be classified as a member of the political wing if at least one of the experts classified him in such a way. According to the second, more restrictive approach, the target needs at least two votes to be classified as a member of the political wing. According to the last, most restrictive approach, a target would be classified as a member of the political wing if there is consensus about it among the experts.[30]

Applying the media coverage seniority criterion to an adjusted database which consists of 136 observations, we identified 39 assassination attempts in which the target was a senior leader.[31] In 33 of these incidents the target of the assassination was killed. Table 2 provides summary statistics on these assassinations. Under the least restrictive criterion for classification of targets into the political wing there were 15 such

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[26] The experts are Yoni Fighel, Shalom Harari, and Yochanan Tzroreff, all research fellows at the International Policy Institute for Counterterrorism, and Arnon Regular and Dani Rubinstein of the newspaper *Ha'aretz*. A potential drawback in the use of expert opinion is the possibility that it is colored by *ex post* developments.

[27] This cutoff level suggested itself as natural because the expert rankings displayed clustering. Targets could essentially be classified into three groups. The low rank military wing members (foot soldiers) tended to receive the rank of 1. Mid-level military wing members tended to receive ranks of 3 or 4. Political wing leaders tended to receive ranks of 9 or 10. Thus by using the cutoff level of 2 we are able to differentiate between the foot soldiers and the rest.

[28] There is a large amount of overlap in the lists of targets classified as senior using the two criteria: almost three quarters of the targets classified as senior by the media coverage criterion were also classified as such by the expert opinion criterion.

[29] One expert declined to classify targets into the political and military wings.

[30] We also attempted to classify targets as political or military using the reporting in the Jerusalem Post. Despite some ambiguities on this issue in the newspaper's coverage, the result was broadly similar to the one obtained by the intermediate expert opinion criterion described above.

[31] We needed to reduce the size of our database because in some cases several assassination attempts have taken place in the same trading day. In such cases we kept in our adjusted database the incident with the most senior target, and for incidents with equally senior targets, the earliest one. We also had to drop several observations where the name of the target was unknown – these were probably low ranked targets.

assassination attempts. Under the more restrictive criterion there were 10 attempts and under the most restrictive criterion there were only 8 such incidents.

Table 3 provides some details on the assassinations that targeted senior leaders. Twenty two of the attempts targeted Hamas leaders, nine Fatah leaders, six Islamic Jihad leaders and two leaders from the Popular Front for the Liberation of Palestine. The climax of the assassinations policy came in the spring of 2004 with the killing of Ahmed Yassin and Abdel Aziz Rantisi, the leader of Hamas and his successor. The spring of 2004 therefore offers a natural end point for our empirical investigation.

III. Empirical Analysis

In this section we examine the determinants of the Israeli stock market reactions to assassination attempts. Figure 2 is a histogram of the percentage change in the Tel Aviv 25 stock market index during the 136 (trading) days in which assassination attempts took place. The Tel Aviv 25 index represents the prices of the 25 most important stocks in the market. The average percentage change is -0.01 (i.e. one percent of one percentage point). This apparent lack of market reaction to assassination attempts masks important differences between cases. The next sub-sections analyze these differences.

A. The Role of Seniority and Political/Military Wing Membership

As we have argued above, there are two potentially crucial determinants of market reactions: the seniority of the assassination target and his identification with either the political or the military wing of his organization. Table 4A presents results of several regressions addressing these two issues. The dependent variable in each regression is the daily percentage change in the Tel Aviv 25 index. All regressions include on the right hand side the percentage change in the NASDAQ stock market index, expressed in Israeli currency terms, and a constant. The percentage change in NASDAQ was added in order to control for external events that might be relevant for the Israeli market.[32] Since the

[32] We obtained similar results when we used alternative U.S. stock market indices, in particular Standard and Poor's 500 and Dow-Jones. Most dual-listed stocks of Israeli firms (those that are listed both in the Israeli and the U.S. markets) are listed in NASDAQ, leading us to prefer this index over the others. Data were adjusted to reflect the fact that trading in NASDAQ and in the Israeli foreign exchange market, unlike the trading in the Israeli stock market, is conducted Monday through Friday. Stock market data for the U.S. was obtained from *Datastream*; exchange rate data were obtained from the Bank of Israel.

Israeli economy is highly integrated with the rest of the world we expect the coefficient for this variable to be positive and significant, as indeed it is in all regressions.[33]

The regression presented in the first column includes on the right hand side a dummy variable for all assassinations. The coefficient for this variable has a value of zero and is statistically insignificant. This reinforces our conclusion (based on Figure 2) that, on average, the market does not react to assassinations. We turn our focus now to the assassination of senior leaders. In column (2) we include two dummy variables, one for assassinations of junior targets (all junior targets are military) and one for senior (both political and military) targets, where seniority is established by the media coverage criterion discussed above. The coefficients are both close to zero and statistically insignificant. One should not draw the conclusion that seniority does not matter, however, as we show next.

In the last three columns of Table 4A we incorporate the distinction between political and military targets, using our three classification criteria. Under all classification criteria the regressions find strong and statistically significant reactions of the market to assassinations of senior targets: negative reactions (of 0.7-1.1 percentage points) to assassinations of senior political targets and positive reactions (of 0.5-0.7 percentage points) to assassinations of senior military targets. The distinction between military and political leadership in Palestinian terrorist organizations turns out to be very important to investors.[34]

An interesting pattern is evident in the last three columns of Table 4A. As we move to the right from column (3) to column (5) we gradually apply more restrictive criteria for classification into the political wing. Since the total number of senior leaders

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[33] When we ran the regressions reported below without the NASDAQ variable results remained practically unchanged. This suggests that the U.S. stock market is in general not sensitive to Israeli assassinations. It is reasonable to assume that the addition of other economic variables to the right hand side of the regressions would not have changed the results much either because the timing of the assassinations is in principle orthogonal to the state of the Israeli economy at the time of their execution.

[34] An alternative interpretation of this result can rely on the fact (noted above) that senior political leaders are on average higher ranked than senior military leaders. Our regression results may therefore be interpreted as reflecting a non-linear reaction of the market to assassinations: the market does not react to the assassinations of low-ranked terrorists, reacts positively to the assassinations of mid-level terrorists, and reacts negatively to the assassinations of top terrorists. This interpretation mirrors the "too much of a good thing" argument made by Rosendorff and Sandler (2004). We believe, however, that the Israeli public is aware of and accepts the distinction between the military and the political wings, and thus that our interpretation of the results is more valid.

is constant this means that we are taking individuals who where originally classified as political leaders (the assassination of which has a negative effect on the market) and reclassifying them as military leaders (the assassination of which has a positive effect on the market). Not surprisingly, this transition manifests itself in the table by the strengthening of the political leadership variable and the weakening of the military leadership variable.

A potentially important factor that we have ignored so far is the question of whether the target of the assassination attempt was killed or not. An assassination attempt should have a reduced effect on the capabilities of a terrorist organization if the target was unhurt or wounded rather than killed. On the other hand it is not clear whether the effect on motivation should be much different depending on whether the target was killed or not. This seems to be especially true with respect to senior political leaders. As we have argued above, the attempt to assassinate a political leader could be perceived as crossing a "red line", regardless of whether he was killed or not.

Following these arguments we redefine the dummy variables to take the value of unity only in those cases where the assassination ended in the death of the target. Table 4B reports the results of this exercise. They are very similar to the ones reported in Table 4A. The main difference is that the negative reaction to assassinations targeting political leaders is now weaker. We interpret this as lending credence to our "red line" argument. This is demonstrated well by the cases of Abdel Aziz Rantisi and Ahmed Yassin. Market reactions to the assassination attempts that ultimately killed both leaders (in 2004) were much milder than the reactions to the first assassination attempts that targeted them (in 2003).[35] The first two assassination attempts signaled that these two top political leaders are not off limits; the final two attempts were thus less of a surprise. The "red lines" were already crossed in 2003.

Table 4C is almost identical in structure to Table 4A. The difference between them is that we now rely on the expert opinion seniority criterion in addition to the media coverage seniority criterion. This allows us to check the robustness of our previous results which were based exclusively on the second criterion. We now define an

[35] The Tel Aviv 25 index dropped by more than two percent on average in the first two assassination attempts; it dropped by only 0.9 percent on average in the final two (see the last column in Table 3).

assassination target as senior if he satisfies both seniority criteria. This leads to 28 targets being classified as senior. The results reported in Table 4C are almost identical to those reported in Table 4A.

B. Additional Determinants of Market Reactions to Assassinations

We proceed by examining several other potential determinants of the stock market reactions to assassination attempts. We do so by adding explanatory variables to a basic specification – that of column (4) in Table 4A. We first examine whether the fact that more than one assassination attempt took place in the same (trading) day affects the stock market reaction. There are 17 such cases in our original dataset. We construct a dummy variable that takes the value of 1 in each of these cases and 0 otherwise. Column (1) in Table 5 shows that the coefficient for this variable is positive and significant. This is not surprising since all the additional incidents involved the targeting of military wing members.[36]

The second issue that we explore has to do with the timing of assassination attempts relative to major terrorist attacks against Israelis. During the period under investigation there were several instances where a terrorist attack occurred either shortly before or shortly after an assassination attempt, within the same (trading) day. In the first case assassinations are sometimes seen as serving to placate the Israeli public's demand for revenge, although Israeli officials tend to deny this connection. In the second case the assassinations are sometimes seen by the Israeli public as manifesting the ability of terrorist organizations to quickly retaliate following assassination attempts. Israeli officials tend to reject this possibility too by claiming that terrorist attacks take a long time to prepare and therefore cannot be executed immediately following an assassination attempt.

To address this issue we compiled a list of the major terrorist attacks directed against Israeli civilians in the period from September 2000 to April 2004.[37] The list includes all events in which five or more Israelis were killed. During the period under

[36] It is possible that the carrying out of several assassination attempts within a short period of time signaled to the Israeli public that the security forces were conducting a massive counterterrorism raid and this translated into the observed strong positive reaction in the stock market.

[37] The main source for information about the terrorist attacks was the International Policy Institute for Counterterrorism. This was augmented by information provided in the media.

investigation there were 42 such attacks: 7 in 2001, 24 in 2002, 8 in 2003, and 3 in 2004.[38] We construct a dummy variable that takes the value of 1 if a terrorist attack occurred within the same (trading) day as an assassination and 0 otherwise. Column (2) of Table 5 demonstrates that the effect of such incidents is strongly negative but insignificant at conventional levels. This effect has the same sign and is similar in magnitude to that of assassinations targeting senior Palestinian political leaders.

An interesting question that we address in column (3) is the following: does the market reaction to an assassination attempt depend on whether it was closely preceded by terrorist attacks? One could argue that if we compare market reactions to two assassination attempts, one that was closely preceded by terrorist attacks and another that was not, the reaction in the first case should be more negative (or less positive) than in the second. This is because the preceding terrorist attacks demonstrated the capability of the terrorist organizations to strike back. To carry out the test we construct a dummy variable that takes the value of 1 if at least one major terrorist attacks took place in the week preceding the assassination (not including the day of the assassination). There are 22 such observations in our database. When we add this variable to our baseline regression we obtain a quantitatively small and insignificant coefficient.

Does the fact that noncombatants were killed in an assassination attempt affect the market reaction to it?[39] We argue that the market should react negatively to the death of noncombatants in assassinations. This is because their death either does not affect or might even increase the capabilities of terrorist organizations and is likely to raise the motivation of these organizations to carry out attacks.[40] To test this hypothesis we add to our baseline regression a variable that captures the number of noncombatants killed in assassination attempts.[41] Column (4) shows that noncombatants' death has a negative and significant effect on the market.

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[38] An assassination coupled (in the same trading day) with a major terrorist attack occurred in 9 cases (out of 136).

[39] Noncombatants are defined here as individuals who are not members of terrorist organizations. This definition excludes members of the political wings of terrorist organizations.

[40] The death of noncombatants may positively affect the capabilities of terrorist organizations because it makes it easier for them to recruit relatives of those killed and others to participate in terrorist activities.

[41] Noncombatants were killed in 18 out of the 136 assassination attempts in our adjusted dataset. The average noncombatant death toll in these cases was 3 persons.

The last issue that we examine in Table 5 is how market reactions to assassination attempts have changed over time. We divided the period under investigation into two equal sub-periods: September 2000 to June 2002 ("early period") and July 2002 to April 2004.[42] We then interacted the dummy variable for the early period with the senior political leader and military leader variables. Column (5) examines the result of a regression that includes the two interaction variables.

We find that the early reactions to assassinations directed at senior political leaders in Palestinian terrorist organizations were negative but much weaker than later reactions. This result quite likely reflects an escalation in the Israeli assassinations campaign. We also find that the early reactions to assassinations of senior military leaders in Palestinian terrorist organizations were positive but weaker than later reactions. However, this difference is not statistically significant.

The last column of Table 5 examines all the additional variables together. Results are qualitatively similar to the ones obtained when the variables were added one at a time. Most importantly, column (6) demonstrates that even when we control for additional explanatory variables we still obtain the result that assassination attempts targeting political leaders have a negative effect on the market while assassinations of military leaders have a positive effect.

C. Aggregate, Sectoral and Specific Firm Reactions to Terrorism-Related Events

This section examines how different market indices and stocks of specific firms react to assassinations of senior leaders and to all major terrorist attacks.[43] Table 6A compares the reaction of three aggregate stock market indices: the Tel Aviv 25 index which we have examined so far, the Tel Aviv 100 index, which represents prices of 100 major stocks, and the Tel Aviv general index, which represents the prices of all the stocks traded in the market. In each regression reported in the table the dependent variable is the daily percentage change in a stock market index and the independent variables

[42] The division of the period into two halves closely coincides with a major change in circumstances on the ground. In April 2002, after a series of major Palestinian terrorist attacks, Israel has invaded and reoccupied large areas in the West Bank. Israeli forces did not evacuate most of the reoccupied areas by the end of the period under examination.

[43] Note that previously we focused on major terrorist attacks that coincided with assassination attempts while here we examine all major terrorist attacks. Rafi Eldor and Rafi Melnik (2004) offer a detailed examination of the effects of terrorist attacks on the Tel Aviv Stock Exchange.

include dummies for assassinations that targeted senior political leaders, assassinations that targeted senior military leaders, and major terrorist attacks.[44] As an additional control variable we include the percentage change in NASDAQ.

The reactions of all three indices to terrorism related events is qualitatively identical: the market declines following assassinations of senior political targets and following major terrorist attacks; the market rises following assassinations of senior military targets. For all three types of events the reaction of the Tel Aviv 25 index is stronger than that of the Tel Aviv 100 index, which in turn is stronger than the reaction of the Tel Aviv general index. A back of the envelope calculation allows us to put these market reactions in perspective. The average market capitalization of the Tel Aviv Stock Exchange during the period under investigation was about 60 billion U.S. dollars. Israel's Gross Domestic Product was about 100 billion U.S. dollars. Thus a one percent change in the Tel Aviv general index is equivalent to a change in market value worth about 0.6 percent of GDP. This means that political assassinations and major terrorist attacks wipe out market value equivalent to about 0.4 and 0.5 percent of GDP, respectively. Military assassinations, on the other hand, lead to increases in market value equivalent to roughly 0.3 percent of GDP.

Table 6B compares the reaction of nine sectoral stock market indices to terrorism-related events.[45] In these regressions we replace the NASDAQ index with the Tel Aviv general index. Almost all the reaction coefficients are statistically insignificant, implying that all sectors react to terrorism-related events in a similar way. The three exceptions are the reactions of the banks sector to major terrorist attacks and the reactions of the insurance sector to assassinations of senior political targets and to major terrorist attacks.

The fact that all sectors display the same qualitative reactions to terrorism-related events masks some potentially interesting differences. Although it is clear that for most Israeli firms more terrorism is bad news, for some it means more business. To contrast the reactions of the two types of firms to terrorism-related events we focus on two specific firms. The first is Blue Square – Israel Ltd., one of the major retailers in Israel. Because of the type of business it is in, we expect that terrorism would be associated with

[44] As in Table 5, we use the intermediate political wing classification criterion to assign senior leaders into the political and military wings of their organizations.
[45] These are the only sectoral indices officially reported by the Tel Aviv Stock Exchange.

a decline in Blue Square's stock price. The second firm is Magal Security Systems Ltd., a major manufacturer in the field of outdoor perimeter protection. It is to be expected that for Magal an increase in terrorism would represent a business opportunity.

What is especially interesting about these two firms is that they are dual listed: their stocks are traded in both the Israeli and the U.S. markets. Blue Square is the only dual listed Israeli firm that is exclusively in retail. Its stock trades on the New York Stock Exchange. Magal is the only dual listed Israeli firm that exclusively produces security related products. Its stock trades on NASDAQ. The fact that the two firms are in different businesses and that their stocks are traded in both the Israeli and the U.S. markets allows us to add another layer to our analysis of reactions to terrorism-related events.

Table 6C reports the results of this analysis for the U.S. market.[46] In each regression the dependent variable is the daily percentage change in the price of the specific stock. The explanatory variables include the three dummies for terrorism-related events and the percentage change in the relevant aggregate stock market index (Standard and Poor's 500 for Blue Square and NASDAQ for Magal).

The reaction of Blue Square's stock price to terrorism-related events is qualitatively identical to that of the Israeli market but quantitatively stronger for the assassination variables. The price of the stock decreases following assassinations targeting senior Palestinian political leaders and following terrorist attacks against Israelis; it increases following assassinations of senior Palestinian military leaders. Magal's stock price reaction to terrorism-related events is qualitatively a mirror image of Blue Square's: it increases sharply following assassinations targeting senior Palestinian political leaders and following terrorist attacks against Israelis (in the first case the reaction is statistically insignificant at conventional levels) but decreases following assassinations of senior Palestinian military leaders. In sum, the results presented in

[46] Arbitrage should work to eliminate any differences in stock prices between the Israeli and U.S. markets implying that we need to analyze the behavior of stocks in only one market. We were able to obtain more stock price data for Magal in the U.S. market so we focus on the stocks' record there.

Table 6C complement and strengthen those obtained from the analysis of the Israeli stock market.[47]

D. The Dynamics of Market Reaction

We turn now to an analysis of the dynamic properties of market reactions to terrorism-related events. In specific we want to examine whether the market reaction represents just a "blip" – a sharp change followed by an immediate reversion - or tends to persist for a longer period. To conduct the analysis we construct a set of ten lags of the dummy variables for the three terrorism-related events. This enables us to capture the dynamics of market reaction for the two trading weeks that follow these events. The regression we employ has on the left hand side the percentage change in the Tel Aviv 25 index. On the right hand side we have the entire set of lagged and contemporaneous dummies as well as the percentage change in the NASDAQ index.

Table 7 reports the results of this regression. Figure 3 uses the output of the regression to plot the cumulative change in the stock market. The impact (same trading day) reaction of the market to an assassination attempt targeting a Palestinian political leader is a drop of 1.1 percent. This negative reaction weakens but does not reverse itself completely during the next two trading weeks. The immediate reaction of the market to the assassination of a Palestinian military leader is an increase of 0.6 percent. This effect too seems to persist and even strengthen in the following trading weeks. The immediate reaction of the market to a major terrorist attack is a drop of 1.2 percent. The market seems to stay quite stable in the following days. We conclude that the evidence does not seem to support a "blip" view of market reactions.[48]

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[47] Claude Berrebi and Esteban F. Klor (2005) examine how terrorism in Israel affects the performance of all Israeli stocks traded in U.S. markets. They find that terrorism has a positive effect on the stocks of defense and security related companies and a negative effect on the stocks of other firms.

[48] According to the Efficient Market Hypothesis an efficient market should react to new information immediately and completely. Our analysis demonstrates that market reactions to terrorism-related events are indeed immediate (within the same trading day). The fact that the market continues to exhibit some fluctuations after the initial reaction may imply that it is not fully efficient. Thus in the case of military assassinations the market seems to under-react initially while in the case of political assassinations the market seems to over-react initially. However, since our regression does not control for many other potential determinants of market movements and since it is likely that over time market participants receive more news one should be cautious in drawing such conclusions.

E. Palestinian Stock Market Reactions

In order to examine terrorism and counterterrorism from a different, potentially complementary, perspective we now turn to an analysis of Palestinian reactions to terrorism-related events, as they are manifested in the Palestinian Securities Exchange.[49] To the best of our knowledge, this study is the first to use data from the Palestinian Securities Exchange in an examination of stock market reactions to terrorism-related events. The Palestinian Securities Exchange started its operation in 1997. The market is relatively thin and trading suffers from periodic interruptions.[50] Surprisingly, despite the drawbacks in the underlying data results are intuitively appealing and strong.

We focus our analysis on the *Al-Quds* index, which represents the prices of 10 major stocks in the market. Data for this index was available to us for the period January 2001 to April 2004. Figure 4 contrasts the behavior of the Tel Aviv 25 stock market index with that of the *Al-Quds* index. The two series tend to display the same broad patterns of behavior. Given the fact that the Palestinian economy is dependent on the Israeli one and that the two stock markets are heavily influenced by the ups and downs of the Israeli-Palestinian conflict, this result should not be surprising.

Table 8 examines the reactions of the Palestinian market to terrorism-related events. In the first column of the table we reproduce, for the purpose of comparison, previously reported results on the effects of terrorism-related events on the Tel Aviv 25 index.[51] In the second column we report the results of a regression of the percentage change in the *Al-Quds* index on terrorism-related event dummies and the percentage change in NASDAQ. Comparing the two columns we find that: both markets react negatively to assassination attempts targeting senior Palestinian political leaders,

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[49] http://www.p-s-e.com/.

[50] As of June 2004 26 companies were listed in the Palestinian Securities Exchange. From January to April 2004 there were 3,200 transactions in the market with the total value of trades equal to 47 million U.S. dollars. Trading days are typically Sunday through Thursday, but occasionally the market does not open for several days or more. We adjusted our terrorism-related events data to the Palestinian Securities Exchange trading schedule. Most importantly, we dropped from our dataset observations where two consecutive trading days were more than three days apart. Experimenting with different thresholds did not alter the results qualitatively.

[51] These are the results displayed in the "Tel Aviv 25" row of Table 6A.

although the reaction of the *Al-Quds* index is stronger; both markets react positively to assassination attempts targeting senior Palestinian military leaders (the reaction of the Palestinian market is statistically insignificant); both markets react negatively, and in a quantitatively similar way, to major terrorist attacks against Israelis.

Summing up, it seems that there is a large degree of similarity in Israeli and Palestinian stock market reaction to terrorism-related events. One possible interpretation of the results is that investors on both sides of the conflict share a common view regarding its desired solution. We plan to further investigate this question in future work.

IV. Discussion

Our analysis addresses some of the main issues raised by the literature on counterterrorism. A key distinction emphasized in this literature is that between defensive and offensive counterterrorism measures. The most important lesson of the analysis of defensive measures is that they induce substitution by the terrorist organizations: policies designed to reduce one type of terrorist attacks tend to increase other attack modes. For example, Jon Cauley and Eric I. Im (1988) and Walter Enders and Todd Sandler (1993) have demonstrated that installation of metal detectors in airports during the 1970s reduced skyjackings but increased other kinds of hostage attacks.[52]

According to this literature offensive counterterrorism measures could lead to inter-temporal substitution: a concentrated counterterrorism offensive during one period could yield a temporary decline in the production of terrorism in that period but at the cost of increased terrorism in later periods. This kind of substitution is suggested by the Enders and Sandler (1993) analysis of the U.S. retaliatory raid on Libya in 1986. The analysis demonstrated that the raid had no long-term effect on curbing terrorist attacks directed against U.S. interests. Bryan Brophy-Baermann and John A.C. Conybeare (1994) studied the Israeli retaliation for the 1972 Munich terrorist attack and reached similar conclusions.

Our analysis focuses on an offensive counterterrorism policy. From an economic perspective assassinations are aimed at diminishing the resources available for terrorist

[52] A survey of the counterterrorism literature on substitution effects is provided by Todd Sandler and Walter Enders (2004). A classic reference on substitution effects in warfare is Mancur Olson Jr. (1962).

organizations. They target individuals who are involved in different modes of terrorist activity, such as shooting attacks, mortar shelling, and suicide bombings. Thus the substitution effects induced by assassinations are relatively limited. Moreover, because the assassinations policy was applied so frequently throughout the *Al-Aksa Intifada*, inter-temporal substitution effects were probably also limited.

Some lessons relevant for counterterrorism policies are implied by the recent economic literature that attempts to examine the root causes of terrorism. Two lines of research are notable within this literature. The first analyzes the connection between poverty and education on the one hand and involvement in terrorism on the other. Studies by Claude Berrebi (2003), Alan Krueger and Jitka Maleckova (2003), and Alberto Abadie (2004) argue that, contrary to conventional wisdom, there is little direct connection between poverty or lack of education and participation in terrorism. These results seem to suggest that economic growth would not necessarily result in the decline of terrorism. Both Berrebi (2003) and Krueger and Maleckova (2003) argue that on the educational front the focus should not be on the quantity of education provided but rather on educational contents.

The second line of research examines terrorism from the perspective of a "club-good" model. Examples include Eli Berman (2003), Eli Berman and David D. Laitin (forthcoming), and Laurence R. Iannaccone (2003). The counterterrorism policy recommendations that are implied by this type of analysis call for action aimed at weakening the terrorist organizations' social service provision networks and strengthening of competing networks through government and markets. The emphasis is on political, economic, and social measures.

The offensive military approach which we have analyzed in this paper could be viewed as a complement to such measures. There is a wide consensus among observers that the Israeli-Palestinian conflict has no military solution and that political dialogue should play the major role in any attempt to resolve it. At the same time it is widely believed, at least among the Israeli public, that the use of force to combat terrorism is inescapable.[53] During the period under investigation assassinating members of

[53] Opinion polls show that during the period under investigation the Israeli public was by and large supportive of the assassinations policy. The Tami Steinmetz Center of Peace in Tel Aviv University

Palestinian terrorist organizations was a major element in Israel's counterterrorism effort. We hope that our study has shed some light on the question of the effectiveness of this policy. Despite the differences in circumstances, the lessons learned from the Israeli experience may serve other countries which face similar dilemmas.

V. Conclusion

Since September 11, 2001 terrorism has been at the center of world attention. The severity of this and other terrorist attacks naturally resulted in enhanced efforts to find effective ways of combating terrorism. One of the most controversial counterterrorism policies is that of assassinations.

This paper offers a unique quantitative economic analysis of the effectiveness of assassinations. We examine the case of Israel, a country that has been suffering from terrorism for years and extensively employs various counterterrorism measures. In the period that we focus on, September 2000 to April 2004, assassinating members of Palestinian terrorist organizations was a major element in Israel's counterterrorism effort.

Our indirect approach to evaluating the effectiveness of assassinations is based on Israeli stock market reactions to news of such operations. We rely on the fact that terrorism has adverse macroeconomic effects on the Israeli economy and on the forward-looking, information-aggregating nature of asset markets to claim that the stock market should react positively to new about effective counterterrorism measures but negatively to news about counter-productive ones.

Using a unique dataset on more than a hundred assassinations attempted during the *Al-Aksa Intifada* (from September 2000 to April 2004), our analysis demonstrates that the reaction of the Tel Aviv Stock Exchange to assassinations depends on two characteristics of the targets: seniority and wing membership. The market does not react to assassinations of low ranked members of Palestinian terrorist organizations. The market does react strongly, however, to the assassinations of senior leaders of terrorist organizations: it declines following assassinations targeting senior political leaders but rises following assassinations of senior military leaders. This implies that the market

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conducts monthly opinion polls focusing on issues related to the Israeli-Palestinian conflict. In several of the polls respondents were asked whether they support the assassinations policy. In all the polls support for the policy was in the range of 60 to 70 percent, with no clear upward or downward trend.

perceives the first type of assassinations as counterproductive but the second as an effective counterterrorism policy.

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TABLE 1 - DESCRIPTIVE STATISTICS ON ASSASSINATION ATTEMPTS

Total number	September 2000 - April 2004	159
Year	2000 (September - December)	10
	2001	40
	2002	56
	2003	44
	2004 (January - April)	9
Location	West Bank	110
	Gaza Strip	49
Method	Shooting (light arms)	75
	Helicopter missiles	54
	Explosive devices	22
	Other	8
Organization[a]	Hamas	80
	Fatah	49
	Islamic Jihad	27
	Other	8
Target killed	Yes	135
	No	24
Persons killed	Combatants[b]	248
	Non-combatants	69
	Total	317

Source: Based on a dataset compiled by the authors as described in the text.
Notes:
[a] In some cases members of more than one organization were targeted simultaneously.
[b] Combatants are defined as members of terrorist organizations.

TABLE 2 - ASSASSINATIONS TARGETED AT SENIOR MEMBERS OF TERRORIST ORGANIZATIONS SUMMARY STATISTICS

	Political wing classification criterion		
	Least restrictive	Restrictive	Most restrictive
Senior member of the political wing	15	10	8
(killed)	(10)	(7)	(5)
Senior member of the military wing	24	29	31
(killed)	(23)	(26)	(28)
Total	39	39	39
(killed)	(33)	(33)	(33)

Notes: The political wing classification criteria are based on the opinions of four experts. According to the least restrictive criterion the target of an assassination would be classified as a member of the political wing (as opposed to the military wing) of his organization if at least one of the experts classified him in such a way. According to the more restrictive criterion the target needs at least two votes to be classified as a member of the political wing. According to the most restrictive criterion a target would be classified as a member of the political wing if there is consensus about it among the experts. Target seniority was established by analyzing coverage in the Israeli newspaper The Jerusalem Post. We define a target as senior if at least two of the following three conditions hold: (1) in the day after the assassination it was covered in a front page article; (2) in the day after the assassination its target was mentioned in more than one article; (3) the name of target was mentioned in the newspaper prior to his assassination.

TABLE 3 – LIST OF ASSASSINATIONS TARGETED AT SENIOR MEMBERS OF TERRORIST ORGANIZATIONS

Date	Main target's name[a]	Organization	Killed	Political[b]			TA25[c]
				L	R	M	
11/09/2000	Hussein Abayat	Fatah	Yes	0	0	0	-1.33
12/11/2000	Anwar Mahmoud Hamran	Islamic Jihad	Yes	0	0	0	1.58
12/31/2000	Thabet Thabet	Fatah	Yes	1	1	1	-1.26
02/13/2001	Massoud Iyyad	Fatah	Yes	1	0	0	-0.13
04/05/2001	Iyad Hardan	Islamic Jihad	Yes	0	0	0	3.66
06/24/2001	Osama Jawabri	Fatah	Yes	0	0	0	-0.33
07/01/2001	Mohammed Besharat	Hamas	Yes	0	0	0	-0.04
07/31/2001	Jamal Mansour	Hamas	Yes	1	1	0	-1.09
08/22/2001	Mohammed Deif	Hamas	No	1	0	0	-0.27
08/27/2001	Mustafa Zibri	PFLP[d]	Yes	1	1	1	0.35
09/06/2001	Raed Karmi	Fatah	No	0	0	0	0.12
10/14/2001	Abdel Rahman Hamad	Hamas	Yes	0	0	0	-0.58
10/18/2001	Atef Abayat	Fatah	Yes	1	0	0	0.86
11/23/2001	Mahmoud Abu Hanoud	Hamas	Yes	0	0	0	1.40
12/17/2001	Yakub Idkadak	Hamas	Yes	0	0	0	-0.82
01/14/2002	Raed Karmi	Fatah	Yes	0	0	0	-0.05
01/22/2002	Nassim Abu-Ros	Hamas	Yes	0	0	0	0.67
03/05/2002	Muhand Dirya Abu Haliwa	Fatah	Yes	0	0	0	-1.98
04/05/2002	Qais Adwan	Hamas	Yes	0	0	0	2.87
04/10/2002	Akram al-Atrash	Hamas	Yes	0	0	0	1.73
07/23/2002	Salah Shehadeh	Hamas	Yes	1	0	0	-1.76
08/06/2002	Ali Ajouri	Fatah	Yes	0	0	0	0.79
09/26/2002	Muhammad Deif	Hamas	No	1	0	0	0.55
11/09/2002	Iyad Sawalha	Islamic Jihad	Yes	0	0	0	1.18
02/17/2003	Riad Abu Zeid	Hamas	Yes	0	0	0	2.82
03/08/2003	Ibrahim al-Makadme	Hamas	Yes	1	1	0	-0.72
03/18/2003	Nasser Asida	Hamas	Yes	0	0	0	4.00
04/29/2003	Nidal Salama	PFLP[d]	Yes	0	0	0	2.53
05/08/2003	Iyad al-Bek	Hamas	Yes	0	0	0	-0.24
06/10/2003	Abdel Aziz Rantisi	Hamas	No	1	1	1	-1.38
06/11/2003	Tito Massoud	Hamas	Yes	0	0	0	-0.60
08/14/2003	Muhammad Sider	Islamic Jihad	Yes	0	0	0	-0.75
08/21/2003	Ismail Abu Shanab	Hamas	Yes	1	1	1	-1.10
09/06/2003	Ahmed Yassin	Hamas	No	1	1	1	-2.72
09/10/2003	Mahmoud Zahar	Hamas	No	1	1	1	-1.70
09/25/2003	Diab Rahim Shweike	Islamic Jihad	Yes	0	0	0	-0.29
12/25/2003	Makhled Hamed	Islamic Jihad	Yes	0	0	0	1.84
03/22/2004	Ahmed Yassin	Hamas	Yes	1	1	1	-1.79
04/17/2004	Abdel Aziz Rantisi	Hamas	Yes	1	1	1	0.00

[a] In some cases several individuals were targeted simultaneously.
[b] Political wing classification criteria (L = Least restrictive, R = Restrictive, M = Most restrictive). See the note in Table 2 for details.
[c] Percentage change in the Tel-Aviv 25 stock market index.
[d] PFLP = Popular Front for the Liberation of Palestine.

TABLE 4A - MARKET REACTIONS TO ASSASSINATIONS

Dependent variable: percentage change in the Tel Aviv 25 stock market index					
	Distinction between members of political and military wings				
	None	None	Political wing classification criterion		
			Least restrictive	Restrictive	Most restrictive
	(1)	(2)	(3)	(4)	(5)
All assassinations	-0.00				
	(0.14)				
Junior (military) target		-0.07	-0.07	-0.07	-0.07
		(0.16)	(0.16)	(0.16)	(0.16)
Senior target		0.16			
		(0.25)			
Senior political target			-0.71***	-1.09***	-1.11***
			(0.25)	(0.27)	(0.33)
Senior military target			0.70**	0.59**	0.49*
			(0.32)	(0.27)	(0.27)
Percentage change in NASDAQ	0.15***	0.15***	0.14***	0.15***	0.14***
	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)
Constant	0.01	0.01	0.01	0.01	0.01
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
R^2	0.05	0.05	0.06	0.06	0.06
Observations	881	881	881	881	881

Notes: The wing classification and seniority criteria are described in a note in Table 2. Estimated by ordinary least squares. Robust standard errors are reported in parentheses. *, **, *** represent statistical significance at the 10, 5, and 1 percent levels in a two-sided t-test.

TABLE 4B - MARKET REACTIONS TO ASSASSINATIONS, TARGET KILLED

Dependent variable: percentage change in the Tel Aviv 25 stock market index					
	Distinction between members of political and military wings				
	None	None	Political wing classification criterion		
			Least restrictive	Restrictive	Most restrictive
	(1)	(2)	(3)	(4)	(5)
All assassinations	0.08				
	(0.15)				
Junior (military) target		-0.02	-0.02	-0.02	-0.02
		(0.17)	(0.17)	(0.17)	(0.17)
Senior target		0.34			
		(0.27)			
Senior political target			-0.54**	-0.73***	-0.63*
			(0.25)	(0.26)	(0.35)
Senior military target			0.72**	0.63**	0.51*
			(0.33)	(0.30)	(0.29)
Percentage change in NASDAQ	0.15***	0.15***	0.14***	0.15***	0.15***
	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)
Constant	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
R^2	0.05	0.05	0.06	0.06	0.06
Observations	881	881	881	881	881

Notes: see notes for Table 4A.

TABLE 4C - MARKET REACTIONS TO ASSASSINATIONS OF SENIOR TARGETS
(Combining Media Coverage and Expert Opinion Seniority Criteria)

Dependent variable: percentage change in the Tel Aviv 25 stock market index				
	Distinction between members of political and military wings			
	None	Political wing classification criterion		
		Least restrictive	Restrictive	Most restrictive
	(1)	(2)	(3)	(4)
Junior (military) target	-0.02	-0.02	-0.02	-0.02
	(0.15)	(0.15)	(0.15)	(0.15)
Senior target	0.04			
	(0.31)			
Senior political target		-0.71***	-1.08***	-1.11***
		(0.25)	(0.27)	(0.33)
Senior military target		0.90*	0.66*	0.50
		(0.50)	(0.38)	(0.36)
Percentage change in NASDAQ	0.15***	0.14***	0.15***	0.15***
	(0.03)	(0.02)	(0.02)	(0.03)
Constant	0.01	0.01	0.01	0.01-
	(0.05)	(0.05)	(0.05)	(0.05)
R^2	0.05	0.06	0.06	0.06
Observations	881	881	881	881

Notes: see notes for Table 4A. An assassination target is defined as senior only if he satisfies both the media coverage and the experts\ ranking seniority criteria

TABLE 5 - DETERMINANTS OF THE MARKET REACTIONS TO ASSASSINATIONS

Dependent variable: percentage change in the Tel Aviv 25 stock market index						
	(1)	(2)	(3)	(4)	(5)	(6)
Junior (military) target	-0.17	-0.01	-0.09	-0.05	-0.07	-0.13
	(0.16)	(0.15)	(0.16)	(0.16)	(0.16)	(0.16)
Senior political target	-1.16***	-0.98***	-1.12***	-0.89***	-1.33***	-1.14***
	(0.29)	(0.28)	(0.28)	(0.28)	(0.30)	(0.40)
Senior military target	0.51*	0.66**	0.56**	0.70**	0.89*	1.08**
	(0.27)	(0.28)	(0.28)	(0.28)	(0.47)	(0.43)
Same day assassination (military targets)	0.77**					0.86**
	(0.39)					(0.35)
Same day terrorist attack		-1.03				-1.03
		(0.63)				(0.65)
Major terrorist attack in previous week			0.15			0.24
			(0.38)			(0.34)
Number of noncombatants killed				-0.13***		-0.17***
				(0.04)		(0.05)
Senior political target, early period					0.82*	0.90*
					(0.48)	(0.48)
Senior military target killed, early period					-0.50	-0.73
					(0.56)	(0.53)
Percentage change in NASDAQ	0.15***	0.15***	0.15***	0.14***	0.15***	0.15***
	(0.03)	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)
Constant	0.01	0.01	0.01	0.01	0.01	0.01
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
R^2	0.06	0.06	0.06	0.06	0.06	0.07
Observations	881	881	881	881	881	881

Notes: Estimated by ordinary least squares. Robust standard errors are reported in parentheses. *, **, *** represent statistical significance at the 10, 5, and 1 percent levels in a two-sided t-test.

TABLE 6A - MARKET REACTIONS TO MAJOR TERRORISM-RELATED EVENTS
AGGREGATE INDICES

Dependent variable: percentage change in the stock market index			
	Tel Aviv 25	Tel Aviv 100	Tel Aviv general
Assassination: senior political target	-1.02***	-0.89***	-0.57**
	(0.28)	(0.25)	(0.25)
Assassination: senior military target	0.63**	0.60**	0.48**
	(0.28)	(0.24)	(0.20)
Major terrorist attack	-1.09***	-0.98***	-0.79***
	(0.20)	(0.18)	(0.15)
Percentage change in NASDAQ	0.15***	0.13***	0.11***
	(0.02)	(0.02)	(0.02)
Constant	0.05	0.05	0.05
	(0.05)	(0.05)	(0.04)
R^2	0.08	0.08	0.07
Observations	881	881	881

Notes: Estimated by ordinary least squares. Robust standard errors are reported in parentheses. *, **, *** represent statistical significance at the 10, 5, and 1 percent levels in a two-sided t-test.

TABLE 6B - MARKET REACTIONS TO MAJOR TERRORISM-RELATED EVENTS
SECTORAL INDICES

Dependent variable: percentage change in the sectoral stock market index							
	Technology	Banks	Mortgage banks	Insurance	Commerce, services	Real estate, construction, agriculture	Industry
Assassination: senior political target	-0.64	-0.17	-0.45	-0.66**	0.27	-0.05	0.11
	(0.65)	(0.22)	(0.41)	(0.30)	(0.38)	(0.10)	(0.12)
Assassination: senior military target	0.13	0.11	0.05	-0.16	0.06	0.06	-0.08
	(0.18)	(0.14)	(0.15)	(0.11)	(0.09)	(0.08)	(0.09)
Major terrorist attack	0.22	-0.24**	0.19	-0.23*	-0.05	-0.00	0.16
	(0.13)	(0.12)	(0.28)	(0.14)	(0.09)	(0.05)	(0.10)
Percentage change in Tel Aviv general	1.22***	1.08***	0.75***	1.15***	1.07***	0.53***	0.97***
	(0.04)	(0.03)	(0.05)	(0.04)	(0.02)	(0.02)	(0.02)
Constant	-0.07**	0.00	0.05	0.06*	-0.03*	0.00	0.03
	(0.03)	(0.03)	(0.04)	(0.03)	(0.02)	(0.02)	(0.02)
R^2	0.69	0.70	0.39	0.68	0.83	0.60	0.78
Observations	881	881	881	881	881	881	881

Notes: see notes for Table 6A.

TABLE 6C - MARKET REACTIONS TO MAJOR TERRORISM-RELATED EVENTS
STOCKS OF SPECIFIC FIRMS

Dependent variable: percentage change in stock price of selected firm		
	Blue Square	Magal
Assassination: senior political target	-2.52***	5.58
	(0.57)	(3.55)
Assassination: senior military target	1.39*	-1.55*
	(0.78)	(0.83)
Major terrorist attack	-0.79*	2.70***
	(0.45)	(1.00)
Percentage change in aggregate stock market index	0.25***	0.09
	(0.08)	(0.15)
Constant	0.10	0.16
	(0.11)	(0.20)
R^2	0.05	0.03
Observations	533	796

Notes: see notes for Table 6A. The aggregate stock market index is Standard and Poor 500 for column (1) and NASDAQ for column (2). The number of observations in each regression varies because the stocks do not trade every day.

TABLE 7 - STOCK MARKET BEHAVIOR AFTER MAJOR TERRORISM-RELATED EVENTS

Dependent variable: percentage change in the Tel Aviv 25 stock market index						
	Assassination: senior political target		Assassination: senior military target		Major terrorist attack	
	Coefficient	Standard error	Coefficient	Standard Error	Coefficient	Standard Error
t	-1.08***	0.31	0.60**	0.27	-1.25***	0.22
t+1	-0.01	0.36	0.07	0.39	0.10	0.21
t+2	-0.39	0.39	0.05	0.26	0.17	0.22
t+3	0.08	0.61	-0.03	0.22	-0.10	0.27
t+4	0.17	0.31	0.58*	0.33	-0.32	0.26
t+5	0.11	0.40	0.42*	0.23	0.38	0.33
t+6	-0.17	0.27	-0.20	0.29	-0.17	0.24
t+7	0.85**	0.40	-0.55**	0.23	0.05	0.22
t+8	-0.16	0.33	0.19	0.34	-0.08	0.26
t+9	0.42	0.34	0.20	0.28	0.13	0.19
t+10	0.02	0.37	0.35	0.33	0.28	0.22
NASDAQ	0.14***	0.03				
Constant	0.01	0.08				
R^2	0.15					
Observations	862					

Notes: The set of explanatory variables includes contemporaneous values and 10 lags of the dummy variables for the three terrorism-related events, the percentage change in NASDAQ, and a constant. The regressions were estimated by ordinary least squares with robust standard errors. *, **, *** represent statistical significance at the 10, 5, and 1 percent levels in a two-sided t-test.

TABLE 8 - ISRAELI AND PALESTINIAN STOCK MARKET REACTIONS TO MAJOR TERRORISM-RELATED EVENTS

	Percentage change in the Tel Aviv 25 index (Israel)[a]	Percentage change in the Al-Quds index (Palestine)
Assassination-political leader	-1.02***	-2.08***
	(0.28)	(0.52)
Assassination-military leader	0.63**	0.42
	(0.28)	(0.52)
Major terrorist attack	-1.09***	-1.19***
	(0.20)	(0.37)
Percentage change in NASDAQ	0.15***	0.03
	(0.02)	(0.03)
Constant	0.05	0.07
	(0.05)	(0.07)
R^2	0.08	0.06
Observations	881	456

Notes: Estimated by ordinary least squares. Robust standard errors are reported in parentheses. *, **, *** represent statistical significance at the 10, 5, and 1 percent levels in a two-sided t-test.

[a] Replicates results from column (1) of Table 6A.

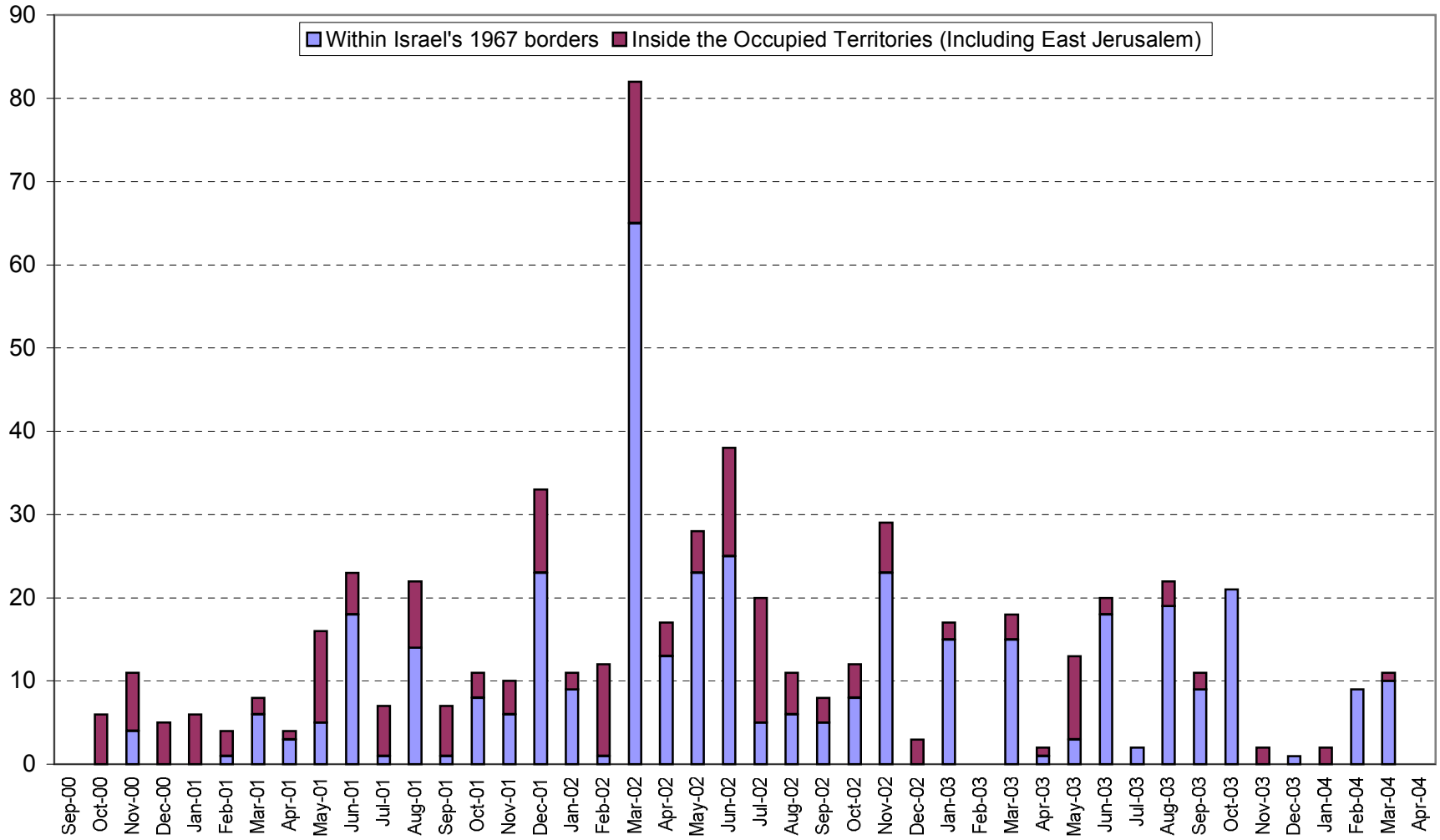

Figure 1
Israeli Civilians Killed in Palestinian Terrorist Attacks
September 2000 - April 2004

Source: B'tselem - The Israeli Information Center for Human Rights in the Occupied Territories

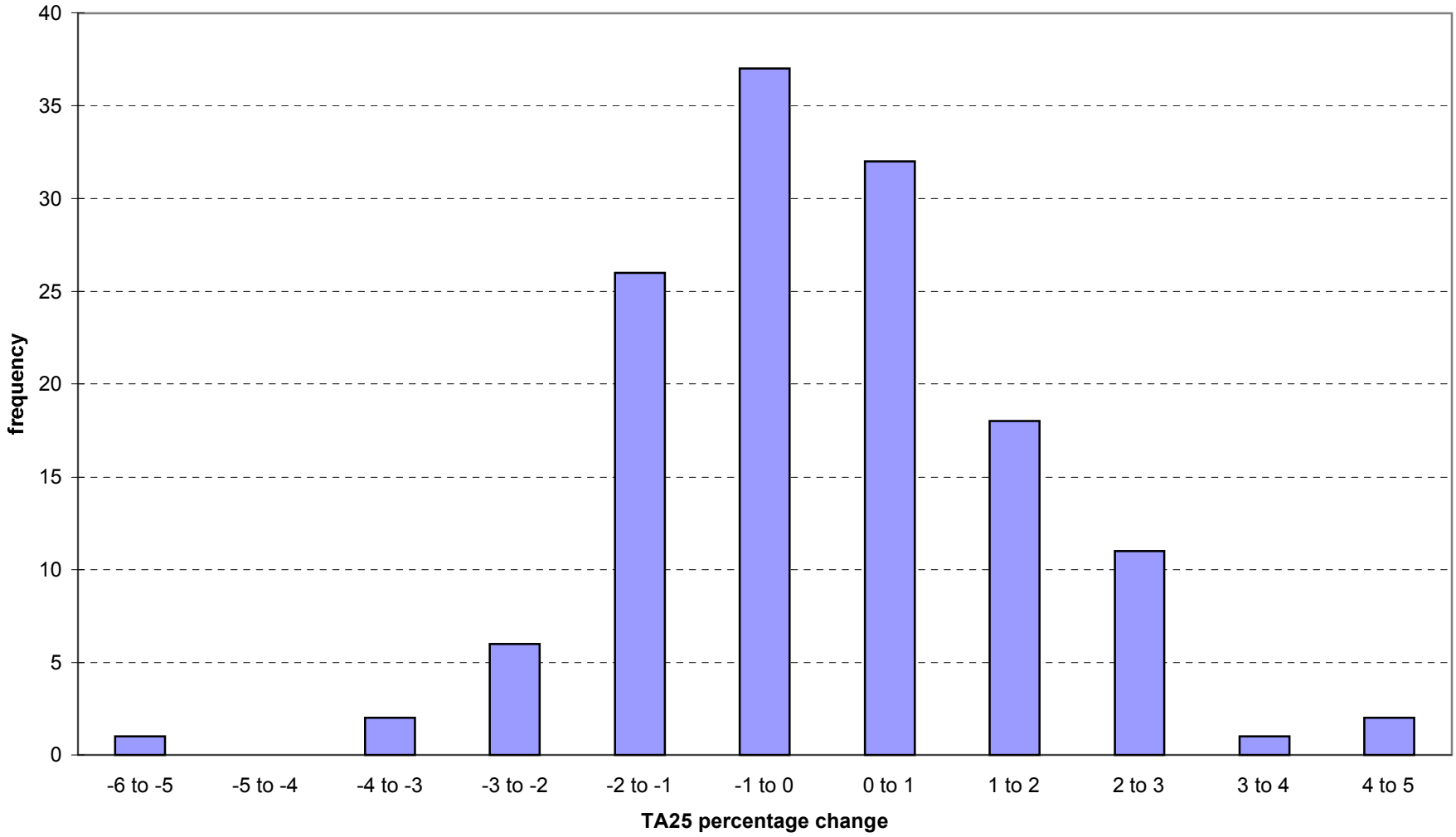

Figure 2
Histogram of Stock Market Reactions to Assassination Attempts
September 2000 - April 2004

Source: see text

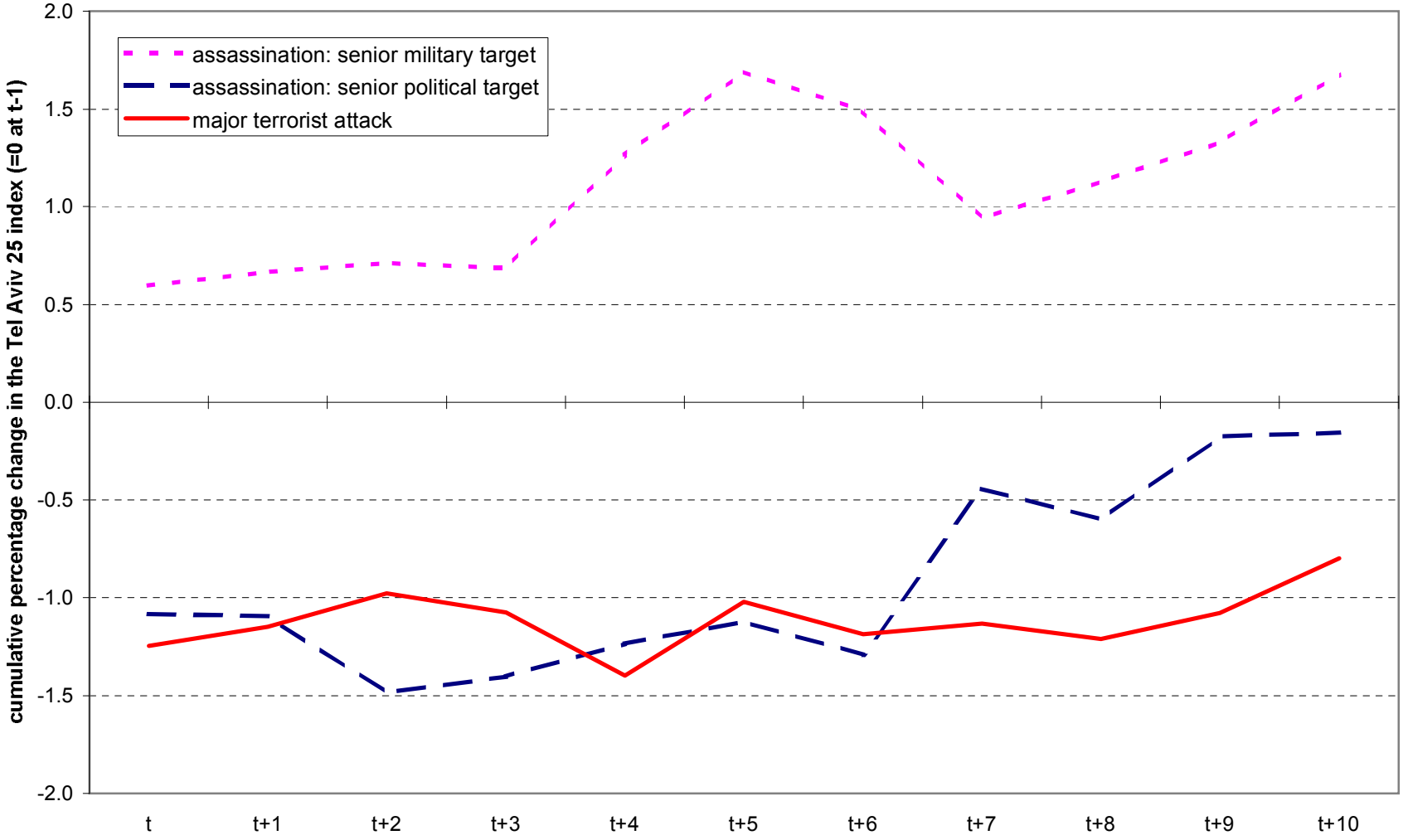

Figure 3
The Dynamics of Market Reactions to Major Terrorism-Related Events

Source: see text.

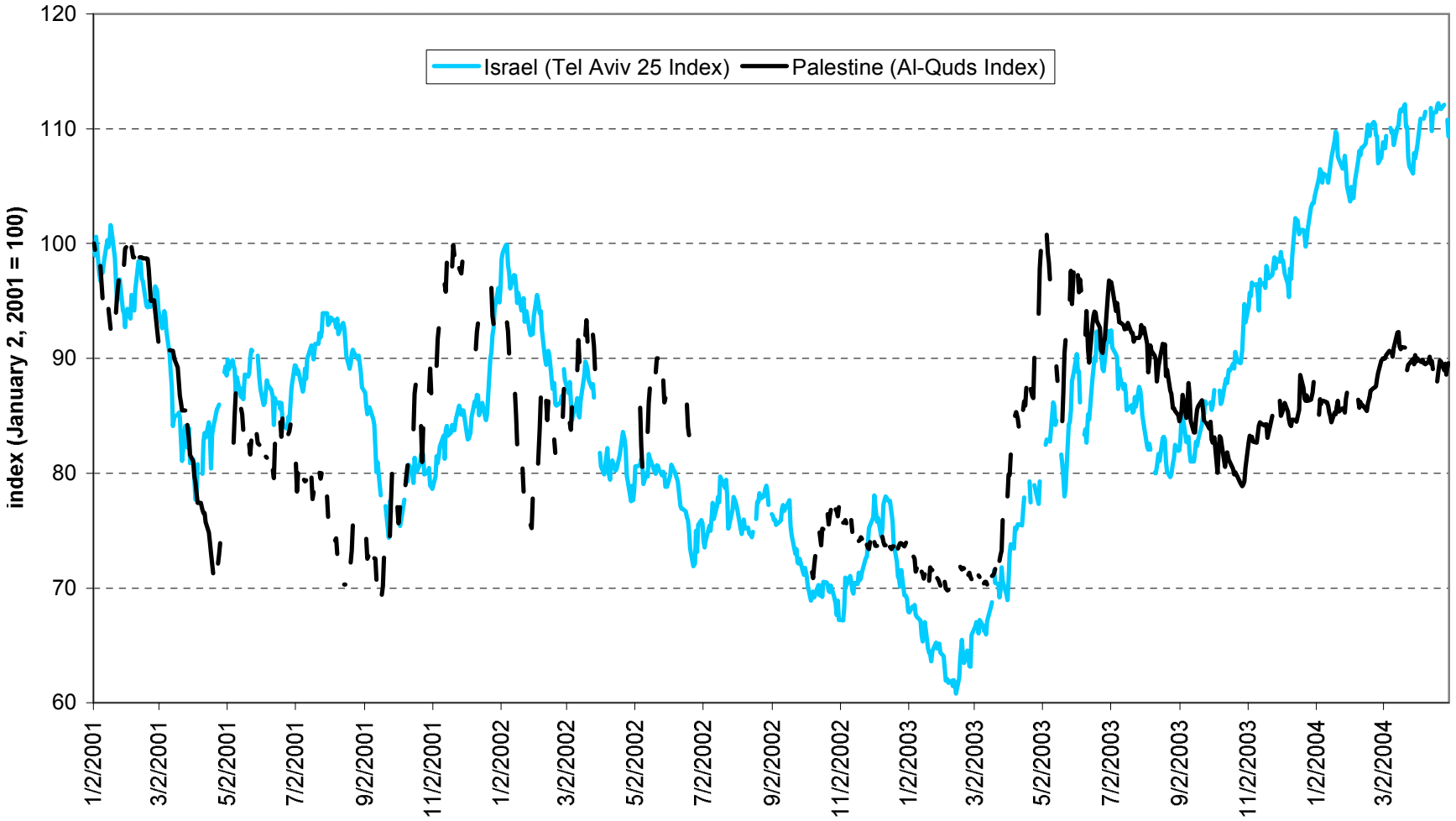

Figure 4
Israeli and Palestinian Stock Markets
January 2001 - April 2004

Source: See text
Note: the figure displays data for all trading days in which either index is available