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War and the World Economy

STOCK MARKET REACTIONS TO INTERNATIONAL CONFLICTS

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One of the perennial questions in the scientific study of war is how war affects the economy. The authors examine the influence that the political developments within three war regions had on global financial markets (CAC, Dow Jones, FTSE) from 1990 to 2000. They embed a rational expectation framework within commercial liberalism, a theoretical strand that tries to assess the interrelationship between war and economic exchanges. Time-series analyses account for the effects that the conflict between Israel and the Palestinians, the first confrontation of a U.S.-led alliance against Iraq, and the wars fought in Ex-Yugoslavia exerted. Using daily stock market data, the authors show that the conflicts affected the interactions at the core financial markets in the Western world negatively, if they had any systematic influence at all. They argue that these results lend some support to the rational expectations version of commercial liberalism.

Keywords: economy and war; commercial liberalism; financial markets; war rallies; E-GARCH and T-GARCH models; event data

Although the economic causes and consequences of armed conflict have received widespread attention (e.g., Barbieri 2002; Mansfield and Pollins 2003; Schneider, Barbieri, and Gleditsch 2003), we know relatively little about the costs of war despite some recent comparative studies (Collier 1999; Cranna 1994; Murdoch and Sandler 2002). Our deficient understanding of the interrelationship between war and

the economy might contribute to the mollifying rhetoric that some political leaders use in the wake of war to downplay the consequences of the impending militarized conflict. Nordhaus (2002, 51) recently wrote in this vein that "while historians have documented the many miscalculations involved in war, little has been written on faulty economic forecasts." Most studies conclude that the aggregate economic consequences of armed conflict are considerable. A research team headed by Cranna (1994, 197) concludes, based on the detailed analysis of seven cases, that "the impact of conflict on human lives, economic development and the environment is devastating." Even optimists maintain that the costs of war typically only vanish within a period of two decades (Organski and Kugler 1977). Recent comparative evidence suggests that the rapid expansion of output that one can observe for the economic development of the United States during World War II is only typical for wars that were fought on foreign soil. As Caplan (2002) notes, the consequences of domestic war on economic growth are negative.

Yet, these assessments seemingly contradict the indifference or even cheerfulness with which international markets sometimes react to the escalation of armed conflicts. Cases in point are the wars that U.S.-led alliances fought against the Iraqi regime of Saddam Hussein. While the Dow Jones index plunged 6.31 percent following the invasion of Kuwait by Iraqi troops in 1990, it gained 17 percent in the first four weeks of Operation Desert Storm (Foster and Earle 2003).[1] The initial stock market reaction to the second war against Iraq was equally positive, with a plus of around 2 percent at the main European Stock markets. The stock market war rally was, however, quickly followed by a period of increased volatility of the main indices when the invasion encountered some fierce resistance.

This study attempts to account for the divergent reactions of the most important financial markets to militarized conflict. We demonstrate that the impact of political events on the financial markets of some of the largest economies largely depends on two factors: (1) the severity of conflictive events and (2) the degree to which economic agents could anticipate both cooperative and conflictive events. Our analysis refines a popular strand in liberal thinking: commercial liberalism. Proponents of this view maintain that international markets are sensitive toward international events and that economic agents abhor war because it endangers mutually profitable exchanges. Markets should, in this perspective, immediately sanction armed conflicts through a quick negative response.

This hypothesis is insofar problematic as it expects a uniformly negative effect of war on stock markets. The standard version of commercial liberalism does especially not take into account that economic agents build up competing expectations about the possible development of a militarized confrontation. While it is reasonable to anticipate negative effects of the average conflictive act, markets might respond positively to certain violent episodes within a war because they signal that the worst is over or that the damage might not be as great as originally expected. Hence, international markets evaluate the costs of various conflict scenarios. They only react to

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1. Analyzing the impact of various World War II events on the value of government bonds, Frey and Kucher (2000) similarly demonstrate that market reactions to crucial events in World War II differed greatly.

an escalation in an upbeat manner as long as the anticipated costs of this move are considerably smaller than the originally expected costs.

To explain the divergent market reactions, we develop a rational expectations argument on the relationship between political events and the world economy. We test our refined version of commercial liberalism in a comparative analysis of the degree to which three major indices (Dow Jones [New York], FTSE [London], CAC [Paris]) reflect international events during a period of ten years. We rely on modifications of a standard model in financial econometrics—the GARCH (1,1) model—to examine the degree to which the day-to-day trading in these stock markets reflects cooperative and conflictive events within three prominent conflict regions: the confrontation between Iraq and the United Nations and some of its member states following the invasion in Kuwait, the conflict between Israel and the Palestinians, and the civil wars in Ex-Yugoslavia. To make the long-lasting confrontations comparable, we relied on the Goldstein (1992) scale to code the conflictive and cooperative events within these conflicts.

The statistical tests show that the international markets do not generally respond to the ups and downs of the three conflicts. The Gulf War and its aftermath also provide some support for the thesis that markets can react positively to intensified conflict in the short run because the display and use of force reduces the uncertainty of the traders over the future development of a crisis. We integrate the possibility of "war rallies" into our refined version of commercial liberalism.

This article is structured as follows: we first discuss the theoretical literature on the impact of war on economic activities. Next, we develop a refined liberal argument and present our research design. The empirical evidence we present is both descriptive and inferential. We conclude with a summary of the findings and a comparison of our general results with the impact that war has on financial markets within war-torn societies and on individual firms and sectors.

HOW SENSITIVE ARE MARKETS TO ARMED CONFLICT?

The second war launched by the "coalition of the willing" against the Iraqi regime of Saddam Hussein in March 2003 has heightened the public debate on the social and economic consequences of war. The empirical problem of this debate is that almost no reliable figures exist on key economic activities in war-affected societies. This makes it easy for both the proponents and the opponents of a war to downplay or exaggerate the human and, in the context of this article, economic costs of combat.

Unfortunately, major social scientific theories of war are no great help in solving this dispute either. While Marxists expect in the tradition of Rudolf Hilferding, Rosa Luxemburg, and Lenin that the capitalist world economy profits from a major war (Schneider and Troeger 2006), both realism and liberalism have speculated intensively over the causal arrow going from trade to conflict rather than the one pointing in the opposite direction. As Barbieri and Levy (1999, 2001, 2003) note, the two leading paradigms in international relations research only cursorily mention the

alleged causal path leading from war to economic activities and especially trade. The two contending approaches converge, however, at least in the conjecture that economic exchange will suffer from warfare (Barbieri and Levy 1999, 2001, 2003). Yet, this interpretation does not hold for all realist work. Some contributions, which draw on the concept of "relative gains," also let us expect that increasing tensions between belligerents might not affect their trade ties severely. As Morrow (1997) holds, even trade with military goods can be equilibrium behaviour in a situation of mutual distrust. This prediction receives some support in the comparative case studies of Barbieri and Levy. They show for some dyads that war did not lead to a significant drop in the amount of traded goods and services between the warring parties.

The skeptical work on the influence of conflict on economic activities is in considerable contrast to the liberal worldview. Generations of economists have reiterated the claim originally advocated by Montesquieu and Kant that war will disrupt trade. Commenting on the situation before World War I, Keynes ([1919] 1971, 1-7) described how "insane delusion and reckless self-regard" let Germany destroy the "nearly complete" internationalization of social and economic life that was present in Europe before 1914. This hypothesis is the reverse side of commercial liberalism, a school of thought that mainly advocates the peace-through-trade conjecture. Although it is not completely obvious why the opposite relationship of less-trade-through-war should automatically hold, only limited theoretical and empirical work in support of the disruption thesis exists. The articles by Anderton and Carter (2001a, 2001b, 2003) belong to these exceptions. They reject the claim by Barbieri and Levy (1999, 2001, 2003) that war does often not affect trade between the belligerents in a significant fashion. The studies by Anderton and Carter have, however, not yet completely settled the controversy over the economic consequences of war. The two liberalists followed the lead of Barbieri and Levy and did not examine their claims on a random sample of dyads.

We advance in this article the claim that the liberal view is most often right but that we can also make some exceptions to this rule. Li and Sacko (2002) show in this vein that the attributes of a conflict, and most notably whether it comes as a surprise, make a difference. Demonstrating that unexpected onsets of armed conflict affect the bilateral level of trade negatively, they lend partial support to the liberal point of view.

In our view, examinations of the disruption thesis that use trade levels as an outcome measure are, however, only limitedly able to test commercial liberalism. Trade, which is just one indicator of economic activities, might not be ideal to account for the market responses to international political events. Trade relationships can, for instance, not be reversed as easily as capital investments. The "stickiness" of trade consequently biases examinations in favor of the null hypothesis.

Our evaluation of the disruption thesis therefore concentrates on how stock markets react to war. Financial market data often lend considerable support to the liberal case. Distinguishing between two periods of British stock market reactions to World War II, Chappel and Eldridge (2000, 491) employ a time-series framework to demonstrate the considerable inefficiency that hampers a war economy. Their results tentatively suggest a psychological foundation for divergent responses to war that possibly reflects "the despair caused by the loss of much of Europe and Scandinavia in the early sub-period, followed by a renewed hope later on." In one of their pioneering

articles on the outbreak of World War I, Holsti and North (1966) regress the daily prices of securities at various markets on the intensity of hostilities. Using the stock markets of two neutral countries as controls, they conclude "that the virtual collapse of prices during July 1914 was directly related to rising international tensions" (Holsti and North 1966, 182). In another early study, Russett and Hanson (1975) come to similar results and note the negative reactions of private investors in the United States to the prolonged war in Vietnam and Korea. Their detailed analysis at the firm level does also not lend support to the Marxist hypothesis that the military industrial complex uniformly profits from war. They note that the reactions to events during the Vietnam War were "almost random" reactions in the period before the Tet escalation. After this turning point, there is a fairly consistent apparent approval of communist conciliatory moves and disapproval of communist escalations of the war (Russett and Hanson 1975, 166).

A further problem of extant work on the disruption thesis is that it does not differentiate between the effects that war has on different industries. Even though these findings cannot be easily generalized, the negative reactions of some particularly sensitive sectors to political violence are well known. Fleischer and Buccola (2002) show, for instance, that the demand of foreign tourists for Israeli hotels significantly reacts to terrorist attacks. Neumayer (2004) reports that terrorism, war, and human rights violations harm tourism. This negative impact is especially pronounced for destinations that can easily be substituted. Similarly, Rigobon and Sack (2003) demonstrate that the increased risk of the second U.S.-led war against Iraq has negatively affected key financial variables. While the dollar, equity prices, and treasury yields declined and the spread of corporate yields widened, oil prices soared. Yet, the impact was not uniformly negative since the escalation that finally resulted in a military campaign did not affect the price of gold or the liquidity premium on the on-the-run ten-year treasury note. The analysis of a future traded on an online betting exchange, dubbed "Saddam Securities," also shows that an increasing probability of war has lowered the stock markets around the world in the wake of the second war of the U.S.-led forces against Iraq (Leigh, Wolfers, and Zitzewitz 2003). These negative effects are larger for countries that are highly integrated into the world economy and that depend heavily on oil imports.

Although we expect the liberal argument to be, on average, right, there are therefore ample reasons to suspect that the effect of war on economic activities is not always negative. The first source for our skepticism is the obvious distributive effect of war. While both the export and import sectors suffer from increasing hostilities, a tax-financed military sector can profit even in a situation of growing global integration (Schneider and Schulze 2003, 2005). Stocks of arms manufacturers will thus typically experience a boost in times of growing tensions, as Brandes (1997) and many others have shown. Similarly, the prospect of an impending war affects the gold and energy sectors negatively. The second objection against the standard version of commercial liberalism is the occurrence of stock market rallies during the course of combat. We focus in this article on this seemingly cynical behavior while we analyze the distributional consequences of international crises in a companion article (Schneider and Troeger 2006).

A war-induced stock market rally typically implies that the use of military force propels international traders to buy stocks instead of alternatives such as gold or government bonds. We investigate whether positive reactions to an escalation are the exception rather than the norm. Although such rallies are, at first sight, morally objectionable, they make perfect sense from an informational point of view. Standard finance theory can account for positive market reactions to war through a rational expectation model.[2] In this view, the prospect of a major diplomatic or armed contest creates uncertainty over the economic costs that can be attributed to the different war and peace scenarios that the international finance community develops. If the market expects a long war, traders will sell stocks and escape into less risky alternatives. A negative collective belief about the possible course of action thus reduces the aggregate value of the stock market, while the expectation of a positive development increases the attractiveness of stocks.

> *Hypothesis 1:* Financial markets react to an intensification of a conflict negatively if they expect the conflict to be costly for the economy.

On many occasions, market reactions will, however, be minimal. Obstfeld and Rogoff (1996, 25-7) show that the reactions of the global financial markets to the Russo-Japanese war were limited. According to them, traders were able to predict the winner of the conflict fairly easily. We believe, therefore, that stock market rallies will only happen if an economy is greatly affected by the political developments of the region in which the war takes place. It should also be noted that war rallies are short-term events. The market recovers at least some of the losses that the uncertainty of the escalation preceding the military campaign incurred. A case in point is again the Gulf War of 1991, where the main markets lost in value after Iraq's invasion of Kuwait but recovered some of these losses during the military campaign of the United States and its allies.

We expect that war rallies occur in situations where an intensification of conflict can be seen as a sign of resolve rather than despair. From an informational point of view, investors can perceive an escalation as a signal that their worst fears will not materialize and that the economic costs of war are smaller than they thought in their most pessimistic scenario. Inversely, conciliatory moves might not always remove the suspicion of some investors that these gestures are neither sincere nor credible and will be followed by more confrontation later on. This will most likely happen in conflicts in which a defender tries to prevent an opponent from escalating a conflict further through costly deterring moves.

> *Hypothesis 2:* War rallies are likely in conflicts that follow the logic of deterrence and in which the main opponents can be easily identified.

We choose the confrontation between Iraq and the U.S.-led alliance, the wars in Ex-Yugoslavia, and the conflict between Israel and the Palestinians to assess how an intensification of the hostility level affects the aggregate value of the stock market.

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2. Li and Sacko (2002) present a similar framework for their empirical inquiry into how different types of militarized interstate disputes (MIDs) affect bilateral trade.

We select these three conflicts because they all have continued for more than three years and engaged the United States, the European Union, or some of its member states in a significant way, be it in the role of the intervening force or as a mediator.

These three conflicts, however, affect the world economy in different ways. We expect that especially the hostilities in Iraq and, to a lesser extent, the ones between Israel and the Palestinians or Ex-Yugoslavia should be of importance to traders. Another difference between these conflicts is the extent to which the Western powers influenced the confrontation. While the United States and Britain were the leading members of the multilateral forces engaged against Saddam Hussein and, at least after some years of Western contemplation, also against Slobodan Milosevic, they could at best indirectly affect the hostilities between Israel and the Palestinians. This means, in other words, that only an increasing level of hostility in the Gulf Region and, to some extent, in Ex-Yugoslavia could be interpreted by the markets as a sign of resolve.

We also anticipate differences across markets. As the firms listed on the various global stock indices differ significantly, we can expect that the impact of political events varies across competing financial centers. We believe that the closeness of a market to a conflict region is mainly responsible for these possible divergences. As investors trading on nearby markets fear a conflict to spread to other markets, they will have a reduced tendency to react positively to increased confrontation. The opposite is the case for far-away markets, where investors are inclined to evaluate how the war affects the domestic economy.

One indication that the market suffers under politically induced uncertainty is a larger volatility of the indices during an international crisis. Although traders might anticipate some international events and adapt their behavior to them, a considerable amount of uncertainty still surrounds international crises. This is why the severity of an event should have a direct impact on the stock market indices. This obviously only holds as long as a crisis is important enough to affect the stock market. This impact largely refers to sectors or firms whose income is affected by a development in a war region and whose stocks are traded within a particular market. Yet not all war events will have the same consequence. We expect that especially severe conflictive events that cannot be easily forecasted will raise the volatility of the stock prizes. Bombings and extraordinarily massive conflictive events fall under this category. This is again in line with our rational expectation framework. As the theory of finance suggests, only surprising events should ex post affect financial markets. Highly escalatory moves are often timed in a way that makes them unforeseeable.

> *Hypothesis 3:* Severe conflictive events have a negative impact on the stock market and increase the market volatility.

Decisive action, be it military or nonmilitary, can alter the beliefs about different crisis scenarios. If an action promises a quick and relatively painless resolution of the conflict, markets will respond positively. Cooperative events will typically stir the optimism of traders while conflictive events incite them to sell stocks. Yet cooperative events do not necessarily build trust at the stock market. According to the same logic, conflictive events can lead to a stock market rally if the confrontation makes a more

costly scenario more unlikely. We nevertheless hypothesize against this backdrop that cooperative events can, on average, more easily be anticipated than conflictive ones.

> *Hypothesis 4:* Conflictive events have a more pronounced effect on stock markets than cooperative events.

RESEARCH DESIGN

This article advances a rational expectation approach to explain the ups and downs of the international stock markets as a partial consequence of armed conflict. We also examine how the volatility of the stock markets reacts to particularly significant events within these confrontations. This suggests, from a purely theoretical perspective, a unifying statistical model that allows us to estimate the effects of political developments on the mean and the volatility of the stock market. It also seems, from a methodological point of view, to be adequate that we calculate a variance equation in addition to the mean equation. The reason for this is that our application focuses on the daily aggregate value of some key stock market indices. High-frequency data of this sort are especially volatile over time and have a time-dependent variance. As it is well known, time dependency of the error variance violates one of the basic Gauss-Markov assumptions for linear regressions and renders the estimation of ordinary least squares (OLS) models inefficient.

We thus have to employ a statistical model in which the variance of the dependent variable is analyzed with respect to its time dependency and substantive explanatory variables. The standard approach used for such a purpose is the GARCH modeling technique. This time-series framework, in which the acronym stands for "generalized autoregressive conditional heteroskedasticity" (Bollerslev 1986), extends the autoregressive conditional heteroskedasticity (ARCH) framework of Engle (1982). Although ARCH and GARCH models have only found some applications in political science (e.g., Beck 1983), they are the workhorse technique in financial econometrics.

The basic philosophy of the ARCH/GARCH models is that present realizations of a time series depend on past information and that the error variance is not constant but varies over time.[3] This assumption is based on the observation that time-series volatility comes in clusters and that periods of high volatility are followed by periods of low volatility. This means, in our context, that important international events in period t increase the effect of other international events in the subsequent periods $t + 1$, $t + 2$, and so on. We can represent the development of a stock market through the information F_t available at period t containing the process X_t and all past realizations in X_t. The most important assumption is that the stochastic error term ε_t is only considered to be centered and uncorrelated.

The standard ARCH model also assumes that the conditional variance of ε_t is a linear function of lagged quadratic errors. To render the estimation efficient, the basic ARCH model just controls away the time dependency of the error variance.

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3. Engle (2001) offers a straightforward introduction to these modeling techniques.

The explanatory setting of this article, however, requires us to explain the variance through past errors *and* a set of exogenous factors. GARCH models also suppose a symmetric effect of positive and negative errors on the volatility of the series. This assumption would, however, be problematic in the present analysis. As we have stated in the fourth hypothesis, negative events should increase the volatility of stock markets more dramatically than positive events. The reason for this divergence is that conflict is much more difficult to forecast than cooperation, especially if the former interaction mode takes the form of terrorist attacks or other actions in which surprise is a constitutive element.

To allow for asymmetric responses in the variance, two modifications of the GARCH model have been suggested: the first alternative, the so-called T-GARCH model, was introduced independently by Zakoian (1994) and Glosten, Jagannathan, and Runkle (1994). Another possible solution is the E-GARCH approach, which was developed by Nelson (1991). We use both types of asymmetric models to analyze the impact of positive and negative shocks on the variance to assess the robustness of the estimation results.

We discuss the characteristics of both models in turn. The T-GARCH model for the variance $\sigma_t^2 = \varpi + \alpha\varepsilon_{t-1}^2 + \gamma D_{t-1}\varepsilon_{t-1}^2 + \beta\sigma_{t-1}^2$ is , where D_t equals 1 for $\varepsilon_t < 0$ and $D_t = 0$ otherwise. The T-GARCH specification allows the impact of the first lag of the squared residuals to have different effects on volatility according to its sign. "Good news" ($\varepsilon_{t-1} > 0$) has an impact of α, while "bad news" influences the variance by $\alpha + \gamma$. Thus, a significant γ provides evidence for asymmetric responses to shocks, with a negative shock having a greater impact on the volatility if $\gamma > 0$ and vice versa.

The variance model of the E-GARCH procedure provides an alternative to the T-GARCH specification and looks as follows:

$$\log(\sigma_t^2) = \varpi + \delta_1 \left| \frac{\varepsilon_{t-1}}{\sqrt{\sigma_{t-1}^2}} \right| + \delta_2 \frac{\varepsilon_{t-1}}{\sqrt{\sigma_{t-1}^2}} + \beta \log(\sigma_{t-1}^2).$$

Asymmetry can be observed in case differs significantly from zero. In contrast to the T-GARCH specification, there is no possibility of a negative variance because of the log-transformation. A negative shock has, in this case, a greater impact on the volatility if δ_2 has a negative sign. The persistence of shocks to the conditional variance is in both specifications given by β. We apply the two models to test for asymmetric effects in the variance equation.

Estimation procedure. All exogenous and endogenous variables are first-differenced for two reasons. First, high-frequency financial data, such as daily stock market indices and exchange or interest rates, are almost always driven by stochastic processes. As unit root tests show, the stock market time series have all a single unit root, and hence they are nonstationary. Unit roots may render OLS regression results spurious; that is, the estimates become inconsistent. In the presence of a nonstationary series, the analyst can either opt for cointegration or for first-differencing the data to render them stationary.

Johansen cointegration tests have shown that none of the three stock markets are cointegrated, which means that cointegration is not an adequate solution.

Second, since we are only interested in the short-term effect of cooperative or conflictive events on the daily stock price, first-differencing is especially warranted. However, the question of the appropriate lag length is crucial in first-difference regressions (Plümper, Troeger, and Manow 2005). Thus, we determined in accordance with two criteria—Bayesian information criterion (BIC) and Akaike information criterion (AIC)—the optimal number of lags that have to be included for the exogenous variables. The tests show that in the case of the two European stock indices, one lag (one day) is appropriate, and for the Dow Jones Index (DJI), the estimation of an immediate impact is warranted. This finding is in line with our expectations since all three analyzed conflicts take place in or close to Europe, and the stock exchange in the United States starts half a day later than the trade on European stock exchanges.

First-differencing renders the stock market time series mean-stationary. However, when we look at the variance of the differenced data, we realize considerable volatility over time. That is, the variance is not constant but time dependent. Unstable variance violates, as already indicated, one of the Gauss-Markov assumptions that are underlying the OLS regression approach.

ARCH Lagrange multiplier (LM) tests showed that time dependency of the error term affects all our estimations. To deal with this kind of heteroskedasticity, we model the asymmetric ARCH process directly within the error term. Note that we do not only apply basic ARCH and GARCH models where the variance is atheoretically modeled by the lagged forecasting variance (GARCH-term) and the lagged squared residuals (ARCH-term). In line with our theoretical model, we also test for asymmetric impacts of positive and negative shocks. We expect that negative shocks have a greater influence on the volatility. Hence, we expect γ to be larger than zero in the T-GARCH specification and δ_2 to be less than zero in the E-GARCH model.

Operationalization. Our main explanatory variable is the impact that contemporary events have on the aggregate value of the three stock markets. We conjecture that international markets evaluate events within an international conflict according to their importance and that both conflictive and cooperative developments have economic repercussions. To estimate the effect of international events on stock markets, we have selected three militarized conflicts during the period from 1990 to 2000 that continued throughout the whole period and actively involved the United States, the European Union, or one of its leading member states as an international actor. We have chosen two European and the main U.S. stock market indices (CAC [Paris], FTSE [London], Dow Jones [New York]) because these three conflicts should have had European repercussions and because the DJI stands almost symbolically for the global economic weight of the United States.

We used the Goldstein (1992) transformation of the World Event Interaction Survey (WEIS) scheme to code the events and to obtain political time series. The Goldstein scale assigns a value from a scale ranging between –10 and 8.3 to each WEIS event type. The category –10 indicates highly conflictive events, and 8.3 is

assigned to extremely cooperative events. Since we expect cooperative and conflictive events to affect the development of the three markets differently, we construct two main variables for each conflict: the sum of the positive events per day and the absolute value of the sum of the negative events per day. Accordingly, both variables are positive and have a minimum of zero. Thus, a positively signed coefficient indicates a positive impact of cooperative or conflictive events and vice versa. In addition, we construct for each conflict a dummy variable that accounts for days during which very severe events occur (events with a Goldstein value of –10).

We relied on the event data collection of King and Lowe (2003) for the three conflicts. Because international politics does not know weekends and holidays, we interpolated the financial series to obtain values for the nontrading days in the four financial centers.

THE IMPACT OF THREE CONFLICTS
ON THREE STOCK MARKETS

In this section, we offer some support for the double conjecture that global markets take the ups and downs of international crises into account and that they occasionally react positively to an escalation. Figure 1 shows that the stock markets under examination developed largely in parallel and that the Dow Jones experienced a slightly more pronounced expansion in the 1990s than the other two indices. We can also observe that a major downturn set in during the first six months of 1999. As previously indicated, we make use of the differenced series for the statistical analysis.

As Figure 2 shows, the three conflicts exhibit different patterns than the stock market data. We have, as indicated, conducted cointegration tests to see whether the series have a long-term equilibrium but are not linked to each other causally.[4] These tests confirmed the intuition nurtured by the visual inspection of the series that no common trend exists.

Figure 2 demonstrates that the escalation in the confrontation between the Security Council and Iraq did not peak during the first war of the U.S.-led alliance against Saddam Hussein. This might be due to the fact that event reporting during wars is much less detailed than during a relatively short confrontation such as the one that took place in December 1998, when U.S. and British forces bombed Iraqi installations, which led to the highest level of conflict observable within the period under examination. The development of the civil wars in Ex-Yugoslavia demonstrates that the interactions on the Balkans became more peaceful after the conclusion of the Dayton agreement. The conflict between the Palestinians and Israel, in contrast, became more conflictive toward the end of the period under examination, when the second Intifada started. Sparks of intensive confrontation and, more seldom, increased cooperation characterize the series throughout the 1990s.

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4. We also calculated models where we disaggregate the conflicts into various dyads such as the ones between Russia and Iraq and the United States and Iraq. The results we obtained are not markedly different from the ones reported in the next section. These models could, however, pose multicollinearity and cointegration problems because interactions in one dyad are often very similar to those in another dyad, especially in multiactor conflicts.
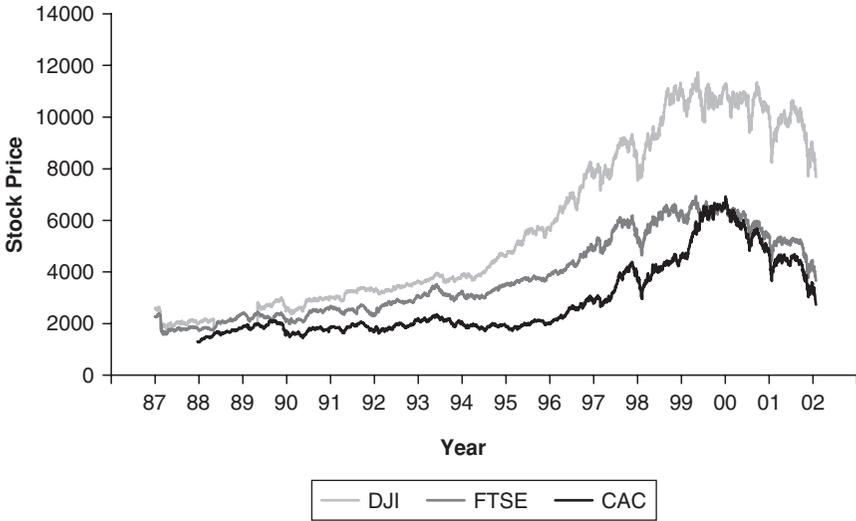
Figure 1:   The Dow Jones Index (DJI), FTSE, and CAC from 1987 to 2002

We now turn to a discussion of the results that we obtained from the inferential statistical analysis. Table 1 allows us to judge all four hypotheses because we examine the impact of positive, negative, and highly severe events separately. The T-GARCH and E-GARCH (1,1) models that we estimate do not suffer from severe autocorrelation, as the Durbin-Watson statistics show. Because the error terms are spherical and normally distributed, heteroskedasticity does also not constitute a problem.

As we have already mentioned, the explanatory variables are lagged one day for the two European stock market indices (CAC and FTSE) and not lagged for the DJI. Even though it is relatively hard to isolate effects of single events in high-frequency data, the estimations provide us with some general trends and help us to detect patterns in the response of stock markets to international crises.

The statistical analyses reported in Table 1 support the four hypotheses. The estimated coefficients lend ample support to our hypothesis that war-induced stock market rallies are only observable for certain conflicts. As the positive impact of the variable "Gulf sum of daily conflict" shows, only the Dow Jones experienced a boost following an intensification of the conflict between the U.S.-led alliance and the Iraq of Saddam Hussein. This indicates that Wall Street mistrusted cooperative developments in this conflict and perceived an escalation as a sign of Western resolve. In the view of the traders, conflictive events in this confrontation reduced the uncertainty and made it more likely that the economic costs of the conflict could be reduced. No war rallies could be observed for the other conflicts and other stock markets. Cooperative events during the conflict have a significant positive effect on the CAC and the FTSE, while they affect the development of the Dow Jones in a negative, though not significant, way.
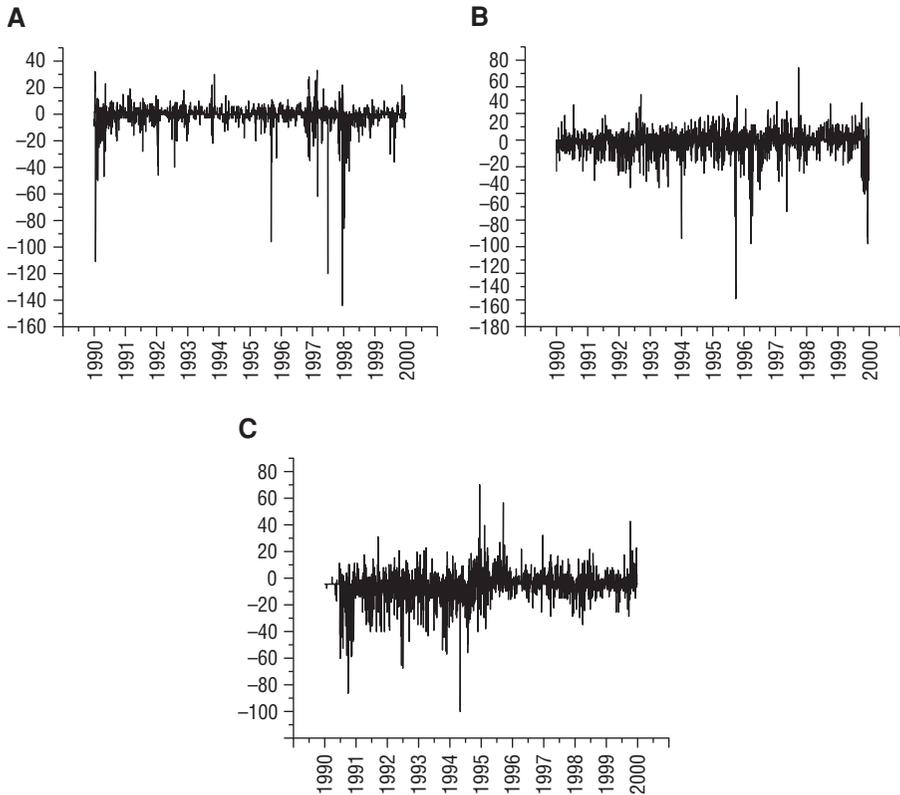
Figure 2: Political Developments in Three International Conflicts: Sum of Daily Goldstein Values: (A) The Gulf War and Subsequent International Interactions with Iraq; (B) The Conflicts between Israel and the Palestinians; (C) Civil Wars in Ex-Yugoslavia

Although we have some evidence for rallies, highly severe and publicly visible events tend to decrease rather than to increase the stock markets. The civil wars in Ex-Yugoslavia and the conflict between Palestine and Israel, for which the reaction patterns to conflict and cooperation are similar for all three stock markets, illustrate the importance of the liberal disruption thesis advanced by Anderton and Carter (2001a, 2001b, 2003) and criticized by Barbieri and Levy (1999, 2001, 2003) especially well. Highly severe and visible shocks, on average, influence the stock prices of all three stock exchanges negatively, though not always significantly. Cooperation between Palestine and Israel is perceived as rather positive for all three stock markets. Interestingly, "positive" events in the Ex-Yugoslavian civil wars rather decrease the stock indices, while seemingly "negative" events exhibit the opposite effect. A possible reason for this unexpected divergence might be that the market mistrusted cooperation that involved the Serbian leadership under Slobodan Milosevic. Contemporaneous severe events in Ex-Yugoslavia dampened the Dow negatively, while the lagged severe events had negative repercussions in Europe.

TABLE 1
The Impact of the Net Sum of Daily Goldstein-Weighted Cooperation and Conflict in Three Conflicts on Three Differenced Stock Market Indices from February 2, 1990, to December 27, 2000 (Maximum Likelihood E-GARCH/T-GARCH (1,1) Models)

	CAC		Dow Jones Index		FTSE	
	E-GARCH	T-GARCH	E-GARCH	T-GARCH	E-GARCH	T-GARCH
Mean equation						
Gulf severity	0.105 (3.055)	0.696 (2.831)	−2.359 (3.968)	−2.635 (4.080)	−1.439 (3.439)	−1.877 (3.468)
Gulf severity $t-1$			−0.246 (0.217)	−0.231 (0.216)		
Gulf sum of daily cooperation	0.285** (0.144)	0.259** (0.142)			0.413*** (0.158)	0.397*** (0.157)
Gulf sum of daily cooperation $t-1$			0.297*** (0.104)	0.297*** (0.106)		
Gulf sum of daily conflict	0.076 (0.093)	0.073 (0.089)			0.143 (0.088)	0.141 (0.088)
Gulf sum of daily conflict $t-1$						
Israel-Palestine severity	−1.242 (1.562)	−0.847 (1.599)	3.109 (2.066)	2.836 (2.090)	−1.902 (1.619)	−2.082 (1.660)
Israel-Palestine severity $t-1$						
Israel-Palestine sum of daily cooperation	0.171** (0.087)	0.180** (0.088)	0.123 (0.130)	0.138 (0.133)	0.082 (0.103)	0.069 (0.106)
Israel-Palestine sum of daily cooperation $t-1$						
Israel-Palestine sum of daily conflict	0.048 (0.076)	0.050 (0.083)	0.007 (0.122)	0.030 (0.124)	0.037 (0.081)	0.057 (0.086)
Israel-Palestine sum of daily conflict $t-1$						

636

Ex-Yugoslavia severity			−2.569 (1.934)	−3.158 (2.070)		
Ex-Yugoslavia severity $t-1$	−1.684 (1.728)	−1.398 (1.672)			−3.467** (1.717)	−3.569** (1.731)
Ex-Yugoslavia sum of daily cooperation	−0.150 (0.096)	−0.166* (0.100)	−0.055 (0.095)	−0.078 (0.090)	0.006 (0.096)	−0.004 (0.094)
Ex-Yugoslavia sum of daily cooperation $t-1$						
Ex-Yugoslavia sum of daily conflict			0.010 (0.092)	0.018 (0.096)		
Ex-Yugoslavia sum of daily conflict $t-1$	0.038 (0.071)	0.014 (0.068)			0.084 (0.080)	0.090 (0.082)
Differenced Dow Jones -1	0.148*** (0.012)	0.149*** (0.012)	−0.022 (0.020)	−0.016 (0.020)	0.179*** (0.014)	0.181*** (0.014)
Differenced CAC	0.011 (0.024)	0.010 (0.024)	0.205*** (0.027)	0.198*** (0.028)		
Differenced CAC $t-1$	0.011 (0.024)	0.010 (0.024)			−0.057** (0.023)	−0.049** (0.023)
Differenced FTSE	−0.065*** (0.021)	−0.065*** (0.021)	0.308*** (0.026)	0.310*** (0.026)		
Differenced FTSE $t-1$	−0.065*** (0.021)	−0.065*** (0.021)			−0.003 (0.024)	−0.008 (0.024)

(*continued*)

TABLE 1 (continued)

	CAC		Dow Jones Index		FTSE	
	E-GARCH	T-GARCH	E-GARCH	T-GARCH	E-GARCH	T-GARCH
Variance equation						
Constant	0.264*** (0.083)	47.680*** (12.559)	1.117*** (0.189)	98.450*** (19.628)	0.072* (0.037)	8.816** (3.816)
Alpha (T-GARCH)		0.008 (0.012)		−0.025** (0.011)		0.008 (0.006)
Gamma (T-GARCH)		0.076*** (0.018)		0.178*** (0.021)		0.045*** (0.011)
Delta1 (E-GARCH)	0.055*** (0.013)		0.101*** (0.023)		0.050*** (0.012)	
Delta2 (E-GARCH)	−0.051*** (0.011)		−0.149*** (0.016)		−0.041*** (0.009)	
T-GARCH(1), beta	0.833*** (0.033)		0.750*** (0.036)		0.948*** (0.014)	
E-GARCH(1), beta	0.949*** (0.014)		0.809*** (0.030)		0.981*** (0.007)	
Gulf severity	−0.007 (0.026)	−19.726 (20.814)	−0.030 (0.063)	1.440 (3.062)	0.008*** (0.002)	11.555* (6.632)
Israel-Palestine severity	0.007*** (0.002)	7.912** (3.563)	0.053** (0.026)	2.386** (1.117)	−0.011 (0.014)	−7.019 (10.484)
Ex-Yugoslavia severity	−0.001 (0.002)	−2.132 (1.445)	0.051** (0.021)	4.142** (1.790)	−0.009 (0.017)	−1.130 (8.740)
N	2,844	2,844	2,845	2,845	2,844	2,844
Adjusted R^2	0.055	0.055	0.146	0.145	0.079	0.079
Log-likelihood	−13,545.87	−13,538.92	−14,469.17	−14,469.08	−13,765.80	−13,765.80
Durbin-Watson	2.02	2.02	2.12	2.13	1.98	1.98

NOTE: Entries are parameter estimates and standard errors. Period dummies (years) are suppressed. The numbers of observations are endpoint adjusted.
*Significant at the 10 percent level. **Significant at the 5 percent level. ***Significant at the 1 percent level.

The variance estimations show, in confirmation of our expectations for all three stock markets, that positive and negative shocks have an asymmetric effect. Specifically, in all three cases, negative shocks have a greater impact on volatility than positive events. This is indicated by a positive and significant γ in the T-GARCH case and a negative significant for Delta2 for the E-GARCH specification. Positive shocks are not even significant in the T-GARCH models. Thus, even though the predictions are not that clear for the expected values, we can detect a significant and stable pattern for the volatility of the three stocks. Negative shocks significantly increase the volatility of the three indices, which lends support to hypothesis 4. In addition, we included in each variance model year dummies, which are not reported because of space constraints. These variables indicate that the volatility significantly increases for CAC, FTSE, and DJI after 1995, probably reflecting changes in the global economy that we are not concerned with in this article.

We add to this analysis a more detailed descriptive examination in which we try to gauge the impact of some of the most important conflictive and cooperative events that have happened in the three conflict regions throughout the 1990s. The detailed analysis for which we use dummies for the days during which important event occurred should provide clear indications on whether a particular type of event was considered to be positive or negative. In the analysis of the aggregated scales, the impact of cooperation and conflict might be somehow blurred because markets can, in some cases, evaluate conflictive events as positive and cooperation as negative developments, as we have seen in the aggregate for the reactions to the ups and downs in Ex-Yugoslavia. As indicated, rallies happen when the market considers a conflictive event less problematic than some alternative original scenarios in which it initially believed. Cooperation, by contrast, can entice negative reactions if investors do not trust the cooperative moves. We summarize this analysis of the most significant events in Table 2.

The analysis reported in Table 2 shows that most of the key events in the three conflicts had repercussions on the financial markets. We can only observe for two events that the market did not differ from the previous day. The reactions of the three markets to the events in the Gulf are most varied, with only four out of eighteen cases of uniformity, while the Israel-Palestine conflict led to analogous effects in twelve out of twenty and Ex-Yugoslavia with ten of twenty events. In most cases, Wall Street was the market that reacted differently. This is most likely a consequence of the fact that the conflicts were happening in much more distant regions (and because we used a time lag of one day for the two European markets but not for the U.S. market). Yet, the reactions to the Iraq events show that traders evaluated the same events often quite differently. The reactions to the beginning of the ground offensive in Iraq are an example of this. While the European markets reacted positively to this, perhaps expecting a quick end to the war, the immediate reaction of the DJI was negative. All three markets have, however, responded positively to the beginning of Operation Desert Storm, which shows, in contrast to the aggregate evidence, that "war rallies" are no phenomenon that is limited to the Wall Street. Such reactions are, however, the exception and are only observable for conflictive events

TABLE 2
The Impact of Individual Events on Three Stock Markets

	CAC	Dow Jones Index	FTSE
Gulf events			
Invasion into Kuwait (8/2/90)	−	−	−
United Nations (UN) SC Resolution 678 authorizing "all necessary means" (11/29/90)	−	+	+
Meeting of Baker and Tariq Aziz (1/9/91)	−	+	−
Ultimatum ends (1/15/91)	+	+	−
Beginning of Operation Desert Storm (1/17/91)	+	+	+
Bombing in Baghdad with more than 300 casualties (2/13/91)	+	−	+
Beginning of ground offensive (2/24/91)	+	−	+
End of the second Gulf War (2/28/91)	+	−	+
Attacks on missile site and nuclear facility (1/7/93)	−	−	−
Iraqi National Assembly recognizes Kuwait (11/10/94)	+	−	+
UN SC Resolution 986 ("Oil-for-Food program") (4/14/95)	+	+	+
First standoff between arms inspectors and Iraq (3/8/96)	−	−	−
Missile attack as response to "safe haven" violation (9/3/96)	−	+	−
Iraq announces to cut ties with weapons inspectors (8/5/98)	−	+	−
United States passes Iraq Liberation Act (9/29/98)	−	−	+
Iraq cuts off work by UN monitors (10/31/98)	−	+	+
UN withdraws staff from Baghdad (11/11/98)	0	−	+
Operation Desert Fox begins (12/16/98)	+	−	+
Israel-Palestine			
Madrid peace conference (10/30/91)	+	+	+
Secret Agreement in Oslo announced (8/30/93)	+	+	0
Israel and Palestinian Liberation Organization (PLO) sign Oslo I agreement (9/13/93)	+	+	−
Israeli massacres 29 Palestinian worshippers (2/25/94)	−	−	+
Israel and PLO sign "Gaza-Jericho First" agreement (5/4/94)	−	−	−
Israel Defense Forces (IDF) soldier kidnapped by Hamas/22 Israelis killed in bus bombing (10/9/94)	+	+	+
Twenty-three Israelis killed in suicide bus bombing (10/19/94)	−	−	−
Israeli and PLO negotiators in Taba achieve partial agreement (8/11/95)	−	−	−
Twenty-five killed, 50 wounded in suicide bombing in Jerusalem (2/25/96)	−	−	−

Event			
Suicide bus bombing kills 19 Israelis in Jerusalem (3/3/96)	−	−	−
Fourteen Israelis killed, 200 wounded in suicide bombing in Tel Aviv (3/4/96)	−	+	+
"Summit of the Peacemakers" at Sharm el-Sheikh (3/13/96)	+	+	+
Israel Air Force raids in Lebanon (4/11/96)	−	−	−
Israel bombs UN base at Kfar Qana; 102 Lebanese civilians killed (4/18/96)	+	+	+
Palestinians "tunnel" riots erupt (9/24/96)	+	+	+
Israel and Palestinian Authority (PA) sign Wye River Memorandum (10/23/98)	−	+	−
Israel and the PA sign Sharm el-Sheikh agreement (9/4/99)	+	+	+
Camp David summit begins (7/11/00)	+	+	+
Camp David summit ends in failure (7/25/00)	−	−	−
Likud leader Ariel Sharon visits Temple Mount/Palestinians riot (9/28/00)	−	−	−
Ex-Yugoslavia			
Slovenia and Croatia declare independence from Yugoslavia (6/25/91)	−	+	+
Croat and Serbs begin fighting in Croatia (6/27/91)	−	−	−
Milosevic plans Greater Serbia (8/12/91)	−	+	+
Bosnia-Herzegovina declares independence (12/29/92)	−	+	+
Serb troop advances in Krajina (1/22/93)	−	+	+
Serb offensive in northern Bosnia (5/13/93)	−	−	−
North Atlantic Treaty Organization (NATO) jets shoot down four Serb planes (2/28/94)	−	−	−
Serbs agree to ceasefire (12/23/94)	+	+	+
NATO aircraft attack Serb ammunition depot (5/25/95)	−	−	−
Bosnian Serbs seize UN peacekeeping troops (5/26/95)	−	−	−
Serbs seize Srebrenica (7/11/95)	−	−	+
Croatia launches offensive against Serb-held territory (8/4/95)	+	+	+
NATO begins air campaign against Serb positions around Sarajevo (8/30/95)	−	−	−
Leaders of Croatia, Bosnia, and Serbia agree to settlement at Dayton (11/21/95)	+	+	+
Peace talks suspended (3/19/99)	−	−	−
NATO launches air campaign against Serb targets (3/24/99)	−	−	−
War crime tribunal indicts Milosevic (5/24/99)	−	−	−
Yugoslavia begins process of withdrawing (6/10/99)	−	−	−

SOURCES: AG Friedensforschung, Universität Kassel; BBC, Canada-Israel Committee; CNN; *Guardian, Keesing's, Time.*
NOTE: + = increase of stock market, − = decrease, and 0 = no change.

641

that have been anticipated for a long time. If conflict occurs unexpectedly, as was often the case in the two other war regions under examination, the reactions of the markets are most often unambiguously negative. The descriptive evidence thus lends some support to our argument that we need to qualify one of the cornerstones of commercial liberalism—the disruption thesis—through a rational expectations framework. As traders have to be concerned with both economic and political developments, they include every piece of available information about relevant armed conflicts in their calculations. If a certain event is better than the original scenario, they will react positively to it, not necessarily distinguishing between "cooperative" and "conflictive" events. If an event has, however, not been foreseen, the market will react unambiguously. Surprising conflictive events will thus lead, as our evidence shows, to a negative reaction, while cooperative unforeseen events have the opposite effect. Our differentiation between reactions to foreseeable and nonforeseeable events is in line with Li and Sacko (2002), according to which unexpected militarized disputes disrupt trade more than expected escalations do.

CONCLUSION

This article introduced a refined version of commercial liberalism to show that international markets react negatively rather than positively to war but that "war rallies" at stock markets can also be occasionally observed. We contend that international traders only welcome conflictive events whose anticipated costs lift the uncertainty over the future course of action and promise a less costly resolution of the conflict than originally anticipated. The stock market rallies that often accompany the beginning of anticipated wars are a typical illustration of this trend. The collective reaction of international traders is thus a useful signal to belligerents about what kind of outcome they expect from a diplomatic or armed contest (Gartzke, Li, and Boehmer 2001; Gartzke and Li 2003; Li and Sacko 2002). As one of us has shown, stock markets can indeed be used to forecast cooperative moves within a conflict; they are, however, not a great help in predicting conflictive steps (Schneider 2005).

Our time-series models, by and large, support the hypotheses that we derived from a refined version of commercial liberalism. The stock market reactions to the international crises were most often negative. One notable exception is how Wall Street reacted to conflictive events in the Gulf. This suggests that, even in an increasingly integrated world economy, not all international crises affect the stock markets in the same way. These differences reflect, in our view, the varying sensitivity of the markets to the same political event.

In contrast to the somewhat ambiguous mean effects of conflictive and cooperative events, the impact of positive and negative shocks is very consistent for the variance. We found, in support of our rational expectation hypotheses, strong evidence for asymmetrical reactions. Conflictive events influenced the volatility of the stock market much more strongly than cooperative ones. The stock market reactions to

international crises thus largely depend on the severity of an anticipated or real international event and the collective expectation that an event will materialize. We believe that similar patterns will emerge when we examine the ups and downs of the financial sectors in the conflict regions themselves, although the overall negative effect might most likely be more pronounced. War rallies are thus most likely a phenomenon that can be observed for countries whose economy is only marginally influenced by growing conflict. Furthermore, as we show in a companion article, military confrontations can have considerable redistributive effects. In particular, certain sectors and firms experience more pronounced boosts because their income might grow as a consequence of a war (Schneider and Troeger 2006).

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