The World Price of War and Peace

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Abstract

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Key Words: War, Peace, Stock Returns, International Crises

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Abstract

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"The art of war is of vital importance to the State. It is a matter of life and death, a road either to safety or to ruin. Hence it is a subject of inquiry which can on no account be neglected."
Sun Tzu, The Art of War, Chapter I, Paragraphs 1-2.

Introduction

Almost once every two months an international crisis starts somewhere in the world. Sometimes it is a crisis without violence, sometimes it is a crisis with minor clashes, and sometimes international crises come as full-scale wars. Not surprisingly, given their far-reaching consequences, international crises have been intensively studied by historians and political scientists alike.

Surprisingly, economists have largely remained silent on the topic of international crises and their impact on the economy.[1] Despite the obvious importance of international crises to the economy and financial markets, economists, so far, have failed to answer the most basic questions. In fact, while seemingly obvious, there is no evidence that 'war risk', or more general 'crisis risk', is priced in financial markets. It is unclear whether crisis risk can be hedged, which might be possible if investors in some countries – considered safe havens – benefit from international turmoil. Although case evidence[2] suggests that war risk has a strong impact on stock markets, we lack even approximate estimates of the size of a crisis risk premium, its economic significance, its stability over time or across crisis regions, and we do not know whether the impact on stock markets depends on the severity of a crisis. In this study we try to answer these basic questions.

We test whether a significant crisis risk premium is present in stock markets; we determine its size and test its robustness. We do this based on a database of 440 major international crises over the period 1918-2002, involving 970 crisis actors.[3] Our results show that international crises reduce world market stock returns with almost four percent annually. The start of a crisis has a large negative impact on world

[1] Most economic studies on the topic date back to the 1940-1945 period. Examples are Bernstein (1940), Jacoby (1942) and Blaisdell (1943).
[2] See for examples and references our discussion of the literature below.
[3] This is the International Crisis Behavior database, which we discuss in the next section.

market returns. This drop in market prices is followed by lower than average returns during the crisis, and a price rise when the crisis ends.

We perform several robustness checks and find that, as one would expect, the impact of a crisis is larger when it involves basic values, like a territorial threat, a threat of great damage (large casualties in a war), or a threat to existence. Markets also react stronger when a great power or a superpower is involved on both sides of the conflict. Thus, the more severe a crisis, the larger are the negative effects. Moreover, we find negative effects of crises in all five sub-periods we consider. However, we reject the hypothesis that the initial impact of crises is similar over time. If anything the market tends to react more strongly in the first month of a crisis in the last sub-period we consider: 1990-2002. While we find differences across regions, these differences are not large enough to unambiguously conclude that the impact of crises depend on crisis regions. We find no significant increase in the crisis risk premium for crises that last longer.

As a final check we consider whether our results hold for individual countries. Our results show that investors in stock markets of countries involved in an international crisis suffer more: stock markets in those countries drop by almost two and a half percent when a crisis starts; lose an additional one percent for every month the crisis lasts; and this value loss is only partially recovered when the crisis ends. While on average a crisis reduces world stock market returns, countries not involved in a crisis only face significant negative returns at the start of the crisis. During and at the end of the crisis we find no significant crisis effect for non-actor countries.

Our estimates can also be interpreted as providing a realistic lower bound of the 'world price of world peace' from the perspective of stock market investors.[4] The main contribution of our paper is that we are the first to do so using a large number of crises. Our results show that economic consequences of an average crisis are large:

[4] Our estimates only provide a lower bound due to survivorship bias (see also Jorion and Goetzmann, 1999). For example, investors in Russian stocks and bonds during the Revolution of 1918 lost all their money. However, as we lack long data series for Russian stock markets, this negative return is not included in our analysis. In addition, there are several months with missing observations for some European countries around the start of Word War II, and some monthly returns are missing for the German stock market at the end of World War II. Furthermore, to the extent that crises are anticipated, our estimates are biased downward. Finally, our analysis does not include civil wars and crises not identified by ICB as international crises.

when measured in world market capitalization at the beginning of 2000, the average crisis costs approximately 250 billion dollar. Of the initial drop at the beginning of a crisis of almost half a percent (or 150 billion dollars in market value) only two thirds are recovered when the crisis ends. For every month a crisis lasts, the market loses another 0.14 percent, or almost 50 billion dollars. With an average duration of 5 months this evidence suggests that stock market investors world wide should be willing to pay more than $250 billion (measured in world market capitalization at the start of 2000) to prevent the average crisis from developing. Or, with on average almost six crises starting every year, more than 1.3 trillion US dollars annually.

Only a limited number of studies consider the interaction between international crises and economic and financial variables. Hess (2004) calculates lower bounds on the welfare loss from conflicts over the period 1960-1992. Even though he only studies the material, economic welfare loss, he finds these costs to be high. His estimates indicate that individuals in countries that experienced conflict would be willing to permanently give up more than 7 percent of their current consumption to live in a purely peaceful world. Hess and Orphanides (1995) develop an economic theory of the political use of wars that links the election cycle, war and economic fundamentals.

There are only a few studies that investigate the impact of international events on financial markets. Niederhoffer (1971) and Cutler, Poterba and Summers (1988) focus on the relation between important news events and stock returns. Both studies include only a limited number of international crises in their samples.

There are several case studies on the effect of war on financial markets. Waldenström and Frey (2002) and Frey and Kucher (2000) study the impact of events during World War II on prices of government bonds of several countries traded in Zurich and Sweden, respectively. More recently, the war in Iraq has stirred interest in the consequences of war on the economy and more specifically financial markets. Rigobon and Sack (2005) study the impact of war risk on several U.S. financial variables. They find that in the ten weeks before the start of the war with Iraq, the risk of war explains between 13 and 63 percent of the variance of financial variables such as the S&P 500, oil prices, gold prices and the US dollar. Amihud and Wohl (2004) find that the likelihood of Saddam Hussein’s fall from power, as reflected in a traded future on an online betting exchange that paid if Hussein was ousted, is related to

stock market returns during the war in Iraq. A rise in the likelihood of Hussein's fall increased US stock returns, strengthened the dollar and lowered oil prices. The same 'Saddam Security' is used by Leigh, Wolfers and Zitzewitz (2003) to estimate the expected cost of the war in Iraq. They find that this specific war would lower the value of US equities with around 15 percent (or 1.1 trillion in market value of all stocks in the S&P 500 index). The studies on the war in Iraq show that in this specific case war, and war risk, had a large impact on financial variables. Our study shows that this conclusion holds in general: the impact of international crises on financial markets is large.

This paper is organized as follows. Section 2 discusses the international crises database. In Section 3 we test for the presence of an international crisis risk premium in world market index returns and report our robustness tests. Section 4 contains the results for individual countries. Finally, Section 5 concludes.

2. Data and Crisis variables

This section first discusses the International Crisis Behavior (ICB) databases, which we use to obtain data on international crises. We then discuss the crisis variables and stock market data.

Crisis Database

The ICB database project started in 1975, and provides detailed information on 440 crises that occurred over the period 1918-2002, and on the 970 crisis-actors (countries) involved in these crises. An extensive discussion of the database, definitions of variables and specific choices made by ICB members can be found in Brecher and Wilkenfeld (1997).

ICB uses the following definition of a crisis. A foreign policy crisis, that is a crisis for an individual state, is a situation with three necessary and sufficient conditions deriving from a change in the state's internal or external environment. All three are perceptions held by the highest level decision makers of the state actor concerned: 1) a threat to one or more basic values, along with 2) an awareness of finite time for response to the value threat and 3) a heightened probability of involvement in military hostilities. An international crisis begins with a disruptive act or event, a breakpoint or

trigger that creates a foreign policy crisis for one or more states and ends with an act that denotes a qualitative reduction in conflictual activity.

For every crisis, ICB distinguishes 66 crisis dimensions and control variables ranging from specific dates, crisis triggers, gravity of the crisis, great power involvement, location and crisis outcomes. In a related database, ICB provides details on all crisis actors in relation to the different crises (in total 80 dimensions, control variables and actor attributes). The ICB-website (www.icbnet.org) contains detailed background information on all 440 international crises. In our analysis, we use starting dates and end dates of crises as identified by the ICB databases as these dates are most likely to reflect, or to be close to, the 'news events' to which investors react. ICB defines the trigger date for a crisis as the date when the earliest actor in an international crisis perceives a crisis. This date is based on the occurrence of an act or event, or derived from, for instance, diaries, memoirs or speeches.[5] In our analysis of the impact of crises on world market returns, we use the crisis trigger date as the most objective start date of a crisis. In our analysis of individual countries, we use crisis trigger dates of individual countries, which might differ from the general crisis trigger date.[6]

The ICB datasets contain numerous variables relating to all aspects of a crisis. We limit our attention to variables that allow us to answer our main question and to perform some basic and simple robustness checks like: Do investors react more strongly if a crisis is more severe? Does the strength of investors' reactions vary over time? Does the reaction differ depending on the crisis region? Does Great or Super Power involvement matter? We transform these ICB variables in such a way that we

[5] A particularly attractive feature of the definitions used by Brecher and Wilkenfeld (1997) in relation to studying the interaction with financial markets is their emphasis on perceived probabilities. A crisis does not necessarily start with an attack or military action but a perceived change in the probability of threat can result in the identification of the start or end of a crisis. This is an attractive feature when we study the separate start and end effects in relation to the stock market, because it lowers the chance that the market has already discounted the crisis.

[6] An example might clarify this distinction: the trigger date for the crisis related to the Japanese attack on Pearl Harbour on 7 December 1941 is 26 November 1941. On that date Secretary of State Hull presented two Japanese envoys with a Ten Point Plan, viewed by Japan as an ultimatum and triggering a crisis for Tokyo. However, we use 7 December 1941 as the trigger date for the United States (as well as Australia, Canada, the Netherlands, New Zealand, and the U.K.) as the attack itself triggered a crisis for these countries. One might argue that we should use 7 December 1941 in our analysis of world market returns, because that was, for this crisis, the date stock markets dropped. However, to avoid arbitrary choices, we choose to use the general trigger dates and end dates of the ICB in our analysis of world market returns. Moreover, the crisis trigger month for individual countries is the same as the general crisis trigger month for more than 75 percent of our sample.

can test the simple hypotheses postulated above. To prevent arbitrary choices we base our decisions on the conventions outlined in Brecher and Wilkenfeld (1997).

Crisis characteristics and variables

To study the impact of international crises on stock returns our most important variable is the total number of crises in month *t*, based on the ICB database: $Crisis_t$. Next, we split the variable $Crisis_t$ in three variables: $Start_t$, $During_t$ and End_t. This allows us to analyze differences in market reactions to the start of a crisis, during the crisis, and at the end of the crisis. More precise, we define $Start_t$ – as the number of crises that start in month *t* based on the ICB database; End_t – as the number of crises that end in month *t*; and $During_t$ – as the number of ongoing crises in month *t*, where month *t* is not the start or the end month. Thus $During_t$ differs from $Crisis_t$ only in the sense that all crises that start or end in a month are excluded from $During_t$ (and included in $Crisis_t$).

Please insert Figure 1. and Table 1. around here.

In total 440 major international crises occurred during the 1918-2002 period. Figure 1 plots the total number of crises in a given month over time. The basic characteristics of the crisis variables we use can be found in Table 1. On average, a crisis starts almost once every two months. We exclude 5 crises from the analysis because the database did not specify an explicit starting date or end date (in terms of month or year), so our total number of observations is 435. We have only 433 observations for our *End* variable as in December 2002, at the end of our sample period, two crises were still continuing: the war in Iraq and a nuclear weapons dispute, between North Korea, the U.S. and South Korea.

The number of crises in any given month seems relatively stable over time. An average month has 2.49 crises. The largest number of crises in a month is ten. This happened during April-July 1919. Apart from a crisis between Nicaragua and Costa Rica, due to a military coup in the latter country, the other crises in that period occurred in the proximity of Russia.

Months without any crises occur approximately ten percent of the time. To be precise: 118 months out of the 1020 months were without any crisis. Crisis-free periods generally do not last long. The longest period without any international crisis was 20

months. It started on 22 December 1929, with the ending of a crisis between the USSR and China over the Chinese Eastern Railway (CER) and lasted until the night of 18 September 1931, when the Japanese Kwantung Army engaged in night maneuvers at Mukden. This triggered a crisis for China and Japan.[7]

The maximum number of international crises that start in a particular month is 4. In January 1981, France and Libya experienced a crisis over Libya's plan to merge with Chad; a Peruvian helicopter was shot down which led to a new crisis between Ecuador and Peru over a long disputed border; a raid by the South African Defensive Forces destroyed an ANC headquarter in Maputo, Mozambique creating a crisis for Mozambique and South Africa; and a crisis for Israel was triggered by a French announcement that a nuclear Osirak reactor in Iraq would be fully operational by 14 July. The maximum number of crises that ended in a given month is also 4. In March 1939, Germany's demand for the annexation of Memel created a crisis for Lithuania; Germany's annexation of Czechoslovakia started and ended a crisis; a dispute between France and Italy ended with a speech of Mussolini; and the occupation of Madrid by the nationalists ended the Spanish Civil War.

The average crisis lasts 152 days. The shortest crisis lasted one day, 30 minutes to be precise, when the appearance of a Libyan plane over Israeli-occupied territory created a crisis for Israel on 21 February 1973. The crisis ended when the plane crashed[8]. The longest crisis - the Civil War in Congo that began July 1998 - lasted 1461 days.

Table 1 also contains the number of crisis per region and time periods. If we group all crises in different regions (Asia, Africa, Europe, Middle-East and Americas), we find that Africa is the most crisis-prone continent (110 major crises) followed by Asia (101 crises). We use the following sub-periods, that differ in polarity structure, as distinguished by the ICB (see also Brecher and Wilkenfeld (1997) for a more extensive description):

[7] Also for Japan because the invasion was an act by the Japanese army without previous sanction by the civil authority and the Japanese government was not interested at that time in war with China.

[8] Another crisis that lasted only one day was triggered when Polisario guerrillas attacked Mauritania's capital on 8 June 1976. This crisis ended the same day when the guerrillas withdrew after their leader was killed.

Multipolar (1918-1939), a period with a diffusion of military power and political decisions among three or more relatively equal units in an international system;
World War II (1939-1945);
Bipolarity (1945-1962), two centers of military and political power in an international system;
Polycentrism (1963–1989), two centers of military power and many centers of political decisions;
Unipolarity (1990-2002), a period with an overwhelming concentration of military capability and political decisions in one entity.

The period identified as 'polycentrism' saw most crises: 194 over a 26 year period. This period also had the highest number of crises per annum: 7.2. The lowest number of crises per annum occurred during the bipolar period. This period had on average 3.2 crises per year.

Some crises are worse than others. We use three variables to capture different aspects of the potential impact of a crisis: gravity of value threat, great power or superpower involvement, and the duration of a crisis. We expect that the more severe crises will have a stronger market impact.

The ICB defines 'Gravity of Value Threat' as the most salient object of threat identified by any actor in a crisis. ICB identifies the following value threats: an economic threat, limited military damage, a political threat[9], threat to influence[10], territorial threat[11], threat of grave damage[12] and the most basic value threat: a threat to existence.[13] For our analysis we define, $GraveThreat_t$, as the number of crises in month t where the value threat involves a territorial threat, a threat of grave damage, or a threat to existence.[14]

[9] Threat of overthrow of regime, change of institutions, intervention in domestic politics, subversion.
[10] Threat of declining power in the global system and/or regional subsystem.
[11] Threat of integration, annexation of part of state's territory.
[12] Threat of large casualties in war, mass bombings as a result of grave damage.
[13] Threat of survival of population, genocide, threat to existence of entity, of total annexation, colonial rule, occupation.
[14] Several variables in the dataset are highly correlated with this variable: crisis management technique, centrality of violence, intensity of violence, extent of violence and timing of violence. When these variables are transformed to a binary variable they are very similar to our variable $GraveThreat_t$.

Using several variables in the ICB dataset, we construct a variable $MajorPower_t$, which equals the number of crises in month t where at least one great power or superpower[15] is involved on both sides of the conflict.[16]

We use the variable $Long_t$ to indicate the number of crises in month t that last longer than the median number of 77 days. This variable is constructed from the variable 'Brexit' in the ICB database which is the elapsed time in days between the first breakpoint – the date on which the first actor perceived itself in a crisis – and the last exit point – the date on which the last actor perceived crisis termination.

Table 1 contains the basic characteristics for these three series. In 99 of the 435 crises there was at least one major power involved on both sides of the conflict. There are 243 crises, which involved threats of the most basic values at some time during the crisis. The average duration of crises is 152 days or around 5 months (The variable *Length*).

Stock market data

Table 2 presents descriptive statistics of stock market index returns for the world market and individual countries. These are monthly stock returns based on the general market price indices taken from Global Financial Data.[17] The world stock price index series is based on the MSCI world market index from 1970 onwards. Before 1970, the world market return is the weighted average of the returns of individual countries.[18]

Our selection of countries is dictated by the availability of stock market data and the involvement of a country in international crises. To be included in our sample, we require stock market data for at least 900 months out of the total 1020 month sample period. We also require the involvement of a country in at least 3 crises in the period

[15] The ICB uses the following hierarchy of powers: superpowers (US and USSR 1945-2002; great powers (France, Germany, Italy, Japan, the UK, The U.S, the USSR 1919-1939) and China (since 1949), France, the U.K. (since 1945); medium powers; and small powers

[16] This variable subsumes several variables in the database: great power involvement in the crisis, content of great power activity, effectiveness of great power activity, the level and number of international systems that are affected, and several variables that describe the perception of crisis actors regarding great power involvement.

[17] We use price indices instead of total return indices because price data are available over a longer period. However, the results reported here similar if we use the shorter total return indices.

[18] The weights in January 1919 are as follows: North America 44% (USA 41%, Canada 3%), Europe 44% (United Kingdom 12%, Germany 8%, France 8%, Italy 4%, Switzerland 2.5%, Netherlands 2.5%, Belgium 2%, Spain 2%, Denmark 1%, Norway 1% and Sweden 1%), Asia and the Far East 12% (Japan 6%, India 2%, Australia 2%, South Africa Gold 1%, South Africa Industrials 1%). It is assumed these country weights did not change until the MSCI indices were introduced in 1970.

for which we have stock market data for that country.[19] Table 2 contains the basic characteristics of our monthly stock return series for both the world market index and the sample of sixteen countries.

Please insert Table 2 around here.

For every country we report the number of crises in which that country was an actor. Australia and Canada faced the lowest number of crises. The United States was involved in sixty-four crises.

As we use log returns values lower than -100 percent are possible. This explains the high negative minimum return (-146%) for Germany. This occurred in July 1948 when Germany reformed its currency, and all financial assets were converted at a rate of 1 Deutschemark for 10 Reichsmark, imposing an immediate 90% loss on all shareholders. Not surprisingly, we find that the world market index has the lowest standard deviation.

3. World Market Results

Main result

To measure the impact of international crises on stock returns, the first question we address is whether world market stock returns depend on the number of crises in any given month:

$$r_t^{world} = \mu + \alpha_1 Crisis_t + \varepsilon_t \qquad (1)$$

where r_t^{world} is the return on the world market in month *t* and ε_t denotes the error term. Next, we distinguish between start effects, effects during the crisis and end effects using the regression:

$$r_t^{world} = \mu + \alpha_1 Start_t + \alpha_2 During_t + \alpha_3 End_t + \varepsilon_t, \qquad (2)$$

Table 3 reports the results for both equations in Panel A and B.

[19] As a consequence of the latter restriction we exclude Denmark, Norway and Switzerland from our analysis.

Please insert Table 3 around here.

There is a strong and statistically significant negative relation between world market stock returns and the number of international crises. A crisis reduces average monthly stock returns by 0.13 percent. With a t-value (based on White standard errors) of -2.06 this result is statistically significant at the 5 percent level.

We conjecture that stock returns react more strongly in the first month of a crisis and also that investors consider the end of a crisis to be good news. In the latter case we might see a positive impact on stock returns in the last month of a crisis. The results in Panel B of table 3 are in line with our hypotheses. We find a significantly negative effect in months when new crises start: returns are almost half a percent lower (0.44 percent), with a t-value of -2.68. During the crisis we see a monthly loss of -0.14 percent, which is smaller than the start effect (t-value -1.67). Finally, in months when crises end, we see a positive effect. Monthly stock returns are on average 0.27 percent higher in those months, although the t-value of 1.55 indicates that this effect is not statistically significant.[20]

To gauge the economic impact of international crises we estimate how much value is lost because of international crises. Or, in other words, what is the cost of an average crisis to investors? At first sight this might seem small: around two thirds of the start effect of -0.44 percent is recovered when a crisis ends (+0.27 percent), and the ongoing loss due to crises is 0.14 percent a month. However, realizing that on average 2.49 crises take place in any given month puts these numbers in a different perspective. Multiplying the average monthly loss by the average number of crises per month implies a value loss due to international crises of almost 4 percent annually.

Dimson, Marsh and Staunton (2002) report a world market capitalization at the start of 2000 of 36 trillion dollar. The average crisis lasts almost five months and avoiding an average crisis should be worth approximately 250 billion US dollars (also measured in world market capitalization at the start of 2000) to investors worldwide.[21]

[20] Arguably this positive end effect is somewhat stronger as an ongoing crisis effect is likely to be present in that month. For the same reason one could argue that the negative start effect is somewhat weaker.

[21] Five times the average monthly loss (0.14) plus start minus end effect muliplied by 36 trillion US dollar gives 248 billion US dollar.

Expressed in world market capitalization at that point in time, a year free of international crises would be worth more than 1.3 trillion US dollars to international stock market investors.[22]

Robustness tests

To verify the robustness of our results we group the variables *Crisis*, *Start*, *End* and *During* based on sub-periods and different crisis-regions as in Table 1. We also investigate whether stock returns react more strongly if a crisis is more severe.

Table 4, Panel A, shows the impact on world market returns of international crises for different crisis regions.

Please insert Table 4 around here.

We find negative coefficients for *Crisis* for all crisis regions except America (North and South are combined). A Wald test rejects the hypothesis that the coefficients are equal across all regions (p-value 0.07). Excluding the American continent we no longer reject the hypothesis of equality across regions (p-value equals 0.75).[23] Furthermore, when we analyze the market reaction in more detail based on *Start*, *During* and *End* variables, we cannot reject the hypothesis that start, during or end effects are equal across regions (p-values 0.58, 0.11 and 0.88 respectively).

Table 4, Panel B shows that the market impact of crises is negative in all subperiods and most negative in the Multipolar period. A Wald test rejects the hypothesis that the estimated coefficients are equal across the five subperiods (p-value is 0.07). We find a significant difference in start effects. The market reaction to the start of crises in the last (Unipolar) period is very strong with a coefficient of -2.26. During this period the world market dropped 5 percent at the start of the Gulf war in August 1990, 6 percent in the month of the Slovenian-Croatian crisis in June 1991, 14 percent in August 1998

[22] This estimate is based on our most conservative annual crisis risk premium (constant of equation 2 minus mean return of the world market (0.335 percent) times 36 trillion US Dollar equal 36.8 percent).
[23] The positive coefficient for the Americas is largely caused by two crises in South America around 1933 that coincided with a strong worldwide bull market at that time. The crises were a conflict over the Chaco region between Paraguay and Bolivia and a crisis for Colombia and Peru over a frontier.

when the US embassy bombing occurred, 9 percent in September 2001 and 11 percent in September 2002 at the start of the Iraq crisis.

We now investigate whether investors react more strongly if a crisis involves severe threats, if a great power is involved on both sides of a conflict, or when a crisis lasts longer. We use the crisis-dimension variables described in Table 1: $GraveThreat_t$, $MajorPower_t$ and $Long_t$ and include these in equation 1 as additional variable. For example, in Table 5, in our model Crisis and Grave Threat (column three) we include the variable $GraveThreat_t$, which denotes the number of crises in month t that involve a threat of the most basic values. The model also includes $Crisis_t$ (the total number of crises in month t) and the coefficient of $GraveThreat_t$ therefore indicates the difference in the impact on world market returns of a severe crisis and a less severe crisis. In the next column (Column four) we report the results for the same variable but now using start, during and end effects.

To facilitate comparison with our main results, we include the results from table 3 in the first two columns. We find that that the most severe crises have a 0.4 percent lower monthly return per crisis than less severe crises (t-value of -2.73). If we split results in a first month effect, a during effect and a last month effect, both the start effect and the during effect tend to be stronger for more severe crises (with a t-value of -1.76 and -2.44 respectively). The effect of crises is also stronger if a major power is active on both sides of the conflict (column 5). In this case there is no significant difference in start effect (column 6). However, during the crisis the market reacts significantly stronger with an additional negative monthly return of 0.43% per crisis (t-value -2.47). While the negative point estimates in column 7 and 8 suggest that the length of a crisis matters, this effect is not significant. Including all three independent variables jointly in our two basic regressions, we reach similar conclusions.

To summarize: our results show a strong and statistically significant crisis effect. Our results also confirm our conjecture that the world market reacts negative in the first month of a crisis, returns are lower when a crisis continues and that, on average, the market goes up if a crisis ends. The market reaction seems fairly similar over time and across crisis regions. We find that the market reacts more negatively if crises threaten

more significant base values, and when there is more at stake because major powers are involved. The length of a crisis has no significant impact. Our results indicate that international crisis risk is priced in financial markets, with an average cost of approximately four percent per annum. We now consider results for individual countries.

4. Individual Countries

This section investigates whether individual countries differ in their reaction to international crises and whether investors in countries involved in a crisis are more strongly affected than investors in countries that are not involved as crisis-actors. To address these questions, we use individual country trigger and end dates, and estimate the following extensions of equation 1 and 2:

$$r_{i,t} = \mu + \alpha_1 Crisis_{i,t} + \alpha_2 CrisisOther_{i,t} + \varepsilon_{i,t} \quad (3)$$

and

$$r_{i,t} = \mu + \alpha_1 Start_{i,t} + \alpha_2 During_{i,t} + \alpha_3 End_{i,t} + \alpha_4 StartO_{i,t} + \alpha_5 DuringO_{i,t} + \alpha_6 EndO_{i,t} + \varepsilon_{i,t} \quad (4)$$

where $r_{i,t}$ is the stock market return in country *i* in month *t*. $Crisis_{i,}$ now refers to the number of international crises in month *t* in which country *i* was a crisis-actor. $CrisisOther_{i,t}$ refers to the number of crises in month *t* involving countries other than country *I*, and $Start_{i,t}$, $During_{i,t}$, $End_{i,t}$ and $StartO_{i,t}$, $DuringO_{i,t}$ and $EndO_{i,t}$ are defined analogously to $Crisis_i$ and $CrisisOther_{i,t}$.

Please insert Table 6 around here.

The results for each of the 16 countries in our sample are in Table 6. At the bottom of the table are mean coefficients (averaged across the 16 countries), and t-statistics based on the standard errors across the 16 countries. Since country stock returns are cross-correlated, standard t-tests applied to the mean could be biased upward. We therefore also present t-statistics –indicated with t*- that are less likely to be affected by this bias. Specifically, for each country, we eliminate an important source of cross-

country correlation by first regressing the country return on the world market return. The residual of this regression is used in equations 3 and 4, and the alternative t-statistic, t*, is based on the mean and standard error across the 16 countries.[24,25]

The results in Table 6, show that markets react strongly to crises in their own country with an average monthly loss of almost one percent.[26] They are not affected by crises in other countries although the coefficient is negative. Similar to the world market, individual countries have a strong negative stock market reaction in the month of the outbreak of an international crisis. The average coefficient of -2.3 percent is highly significant. The individual country coefficients range from a high of 0.7 percent for Japan, to a low of – 7.9 percent for Finland. Investors in individual countries suffer when their country becomes involved in a crisis. Out of all 16 countries only 2 have a positive coefficient. For the biggest economy during our sample period, the US, we find an average stock market drop of 0.8 percent in the month in which the US gets involved in an international crisis.

On average an ongoing crisis in an actor country has significant negative effect of -1.2 percent a month. However, there is large variation across countries. In some countries the effect is positive or almost zero. In other countries the effect is extremely negative (Finland: -10.75 percent). Based on the t-statistics these results are borderline significant at the ten percent level. In the month a crisis ends, the stock market in countries that are involved in the crisis goes up with, on average, 1 percent. This average coefficient is significant at the 5 percent level. The return for individual actor countries in the month international crises end is positive for 11 of the 16 countries, and ranges from a low of -1.8 percent for the UK, to a high of 4.9 percent for Germany.

Countries that are not involved as actor experience an average market decline of 0.3 percent if an international crisis starts somewhere in the world. Only 2 individual country coefficients are positive, and the average coefficient is significantly negative.

[24] We have also split the sample in 8 periods of approximately 10 years. We estimate the models for each period and calculate the mean coefficient and time-series standard error across the 8 periods (see Fama and McBeth, 1973). The results of this analysis lead to the same conclusions.

[25] Note that for StartO, DuringO, and EndO we do not include the alternative t-statistic. Including the world market return combined with the negative effects for start and during results in a mechanical positive bias for Start Other and During Other.

[26] It is interesting to compare this estimate to the reaction of investors in stock markets in the year before these markets permanently or temporarily disappear due to political turmoil or war. Jorion and Goetzmann (1999) document negative returns of around 20 percent in the twelve months before market closure based on a sample of 25 countries.

During a crisis in other countries there is no notable effect on stock market returns in non-actor countries. The coefficient is only 0.04 percent. At the end of crises, the stock market reaction in non-actor countries is positive on average, but the effect is small and not significant. Nine countries have a positive coefficient, and seven countries have a negative coefficient.

Conclusions

We document - using a large dataset of 440 international crises - that the cost of international crises to investors is large. On average, investors lose 4 percent every year due to international crises. In terms of world stock market value at the end of last century this means a net loss of approximately 250 billion US dollars in market value per crisis, or around 1.3 trillion dollars annually.

We find that markets react more strongly, when crises are more severe or when there is more at stake due to the involvement of major powers. While costs for investors worldwide are high, investors in actor countries, pay a much higher price: the average market value lost is almost 2.5 percent when a crisis starts and an additional one percent for every month the crisis lasts. Markets in those countries rise one percent when a crisis ends. For no country in our sample do we find evidence to suggest that investors profit significantly from crises involving other countries.

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Table 1. Basic characteristics of crisis variables.

Variables	Mean	Std	Min	Max	Sum
Crisis	2.489	1.722	0	10	2539
Start	0.426	0.677	0	4	435
End	0.425	0.684	0	4	433
During	1.699	1.386	0	10	1733
Asia	0.099	0.315	0	2	101
Africa	0.109	0.356	0	3	110
Middle East	0.080	0.276	0	2	82
Europe	0.090	0.334	0	4	92
America	0.049	0.221	0	2	50
MultiPolar	0.073	0.311	0	4	74
WWII	0.031	0.201	0	2	32
BiPolar	0.085	0.343	0	3	87
PolyCentrism	0.190	0.520	0	4	193
UniPolar	0.048	0.236	0	3	49
GraveThreat	0.238	0.492	0	4	243
Major Power	0.097	0.322	0	2	99
Length	152	201	1	1461	
Long	0.497	0.5	0	1	216

Notes: Mean, standard deviation, minimum, maximum and sum for all crisis variables used in our analysis. *Crisis* denotes the number of crises that take place in any month. This variable is split up in *Start*, *During* and *End*, which denote the monthly number of starting, ongoing, and ending crises, respectively. We group crises (using the Start variable) in different regions and different time periods. *GraveThreat* denotes the number of crises that involve a threat to existence, a threat of great damage or a territorial threat. *Major Power* denotes the number of crises where a great power or a superpower is involved on both sides of the conflict. *Length* denotes the crisis duration in days, and *Long* is the number of crises that last longer than the median duration of 77 days.

Table 2. Basic characteristics of monthly stock returns

Country	Start Date	Mean	Standard Deviation	Minimum	Maximum	# obs.	# obs missing	# Crises
World Market Index	1919:03	0.33%	3.71%	-20.03%	13.93%	1006	0	435
Australia	1918:03	0.49%	4.30%	-55.24%	20.11%	1020	0	3
Belgium	1926:01	0.30%	5.10%	-26.03%	23.13%	908	16	9
Canada	1918:12	0.40%	4.72%	-33.46%	20.59%	1009	0	3
Finland	1922:03	0.77%	5.78%	-32.55%	35.16%	965	5	6
France	1919:01	0.60%	5.63%	-27.61%	24.25%	996	12	31
Germany	1918:01	0.26%	9.12%	-146.00%	68.87%	986	33	24
India	1922:09	0.40%	5.31%	-25.72%	35.06%	949	2	18
Italy	1918:01	0.59%	7.42%	-30.76%	46.81%	989	2	12
Japan	1918:01	0.56%	6.26%	-30.79%	50.87%	1009	11	15
Netherlands	1919:02	0.43%	4.44%	-20.27%	25.24%	981	26	11
Austria	1922:03	0.67%	7.57%	-39.72%	114.75%	933	37	4
South Africa	1918:01	0.61%	4.97%	-35.14%	21.64%	1020	0	4
Spain	1918:01	0.41%	4.82%	-33.48%	21.12%	976	44	8
Sweden	1918:01	0.44%	5.02%	-38.75%	24.30%	1020	0	5
United Kingdom	1918:01	0.42%	4.72%	-30.92%	42.32%	1020	0	43
United States	1918:01	0.48%	5.51%	-35.63%	35.24%	1020	0	64

Notes: Start date is the first month for which stock market price index data are available in Global Financial Data. # obs. Missing is the number of missing observations in the period between the start and end of the return series. #crises is the total number of crises for each country in the period for which stock returns are available.

Table 3. The world price of international crises

Panel A: Crisis				
		Estimate (%)	**t-value**	**p-value**
Constant	μ	0.657	**3.38**	**0.001**
Crisis	α_1	-0.129	**-2.06**	**0.040**

Panel B Start, During, End				
		Estimate (%)	**t-value**	**p-value**
Constant	μ	0.642	**[3.29]**	(**0.001**)
Start	α_1	-0.437	**[-2.68]**	(**0.007**)
During	α_2	-0.138	**[-1.67]**	(**0.095**)
End	α_3	0.266	[1.55]	(0.121)

Notes: Panel A contains the estimation results for equation 1: $r_t^{world} = \mu + \alpha_1 Crisis_t + \varepsilon_t$ where $Crisis_t$ is the total number of crises in month t. Panel B contains the estimation results for the regression 2: $r_t^{world} = \mu + \alpha_1 Start_t + \alpha_2 During_t + \alpha_3 End_t + \varepsilon_t$ where $Start_t$ and End_t denote the number of crises that start and end in month *t*, respectively. $During_t$ is total number of crises which occur in month *t* excluding all crises that start or end in that month. (t-values and p-values are based on heteroscedasticity consistent standard errors). T-values and p-values in bold denote significance at the ten percent level.

Table 4. Results for different regions and sub-periods

Panel A:	**Regions**			**Panel B:**	**Sub-periods**		
	Equation (1)		Equation (2)		Equation (1)		Equation (2)
Intercept	0.653		0.632	Intercept	0.608		0.613
	[3.34]		[3.16]		[**3.05**]		[**3.07**]
Asia		Start	-0.673	*Multipolar*		Start	-0.926
			[-1.57]				[**-2.39**]
Crisis	-0.163	During	-0.193	Crisis	-0.283	During	-0.192
	[-1.09]		[-1.06]		[**-3.49**]		[**-1.65**]
		End	0.491	(1918-1939)		End	-0.235
			[1.29]				[-0.51]
Africa		Start	-0.617	*World War II*		Start	-0.196
			[**-1.68**]				[-0.37]
Crisis	-0.040	During	0.033	Crisis	-0.097	During	-0.242
	[-0.28]		[0.18]		[-0.62]		[-0.88]
		End	0.252	(1939-1945)		End	0.345
			[0.74]				[0.95]
Europe		Start	-0.646	*Bipolarity*		Start	-0.324
			[**-2.29**]				[-1.28]
Crisis	-0.279	During	-0.253	Crisis	-0.100	During	-0.114
	[**-2.38**]		[**-1.69**]		[-1.06]		[-0.75]
		End	-0.033	(1945-1962)		End	0.133
			[-0.09]				[0.43]
Americas		Start	0.108	*Polycentrism*		Start	-0.086
			[0.26]				[-0.36]
Crisis	0.428	During	0.551	Crisis	-0.011	During	-0.095
	[**1.75**]		[**1.78**]		[-0.14]		[-0.75]
		End	0.462	(1963-1989)		End	0.351
			[0.90]				[1.49]
Middle East		Start	-0.289	*Unipolarity*		Start	-2.255
			[-0.66]				[**-3.56**]
Crisis	-0.312	During	-0.370	Crisis	-0.131	During	0.096
	[**-1.70**]		[-1.64]		[-0.89]		[0.52]
		End	0.161	(1990-2002)		End	0.767
			[0.41]				[1.32]
Region				**Sub-periods**			
Wald test		Start	12.49	**Wald test**		Start	2.90
			(**0.014**)				(0.575)
Crisis	8.66	During	2.32	Crisis	8.76	During	7.58
	(**0.070**)		(0.677)		(**0.067**)		(0.108)
		End	2.36			End	1.20
			(0.671)				(0.879)

Notes: Estimation results for the equation 1 in the text: $r_t^{world} = \mu + \alpha_1 Crisis_t + \varepsilon_t$ where $Crisis_t$ is the total number of crises occurring in month t. and estimation results for the regression 2: $r_t^{world} = \mu + \alpha_1 Start_t + \alpha_2 During_t + \alpha_3 End_t + \varepsilon_t$ where $Start_t$ and End_t denote the number of crises that start and end in month *t*, respectively. $During_t$ is total number of crises that occur in month *t* excluding all crises that start or end in that month. All variables are subdivided in different regions and sub-periods. T-values and p-values are based on heteroscedasticity consistent standard errors). T-values in square brackets and p-values in round brackets. T-values and P-values in bold denote significance at the ten percent level. Wald test statistics test whether *Crisis*, *Start*, *During* and *End* coefficients are equal across regions and sub-periods. These test statistics have a chi-squared distribution with 4 degrees of freedom.

Table 5. Results for severe crises, major power involvement and long crises.

	Main result		**Grave Threat**		**Major Power**		**Long**		**All**	
	Crisis	**Start/ During/ End**	**Crisis**	**Start/ During/ End**	**Crisis**	**Start/ During/ End**	**Crisis**	**Start/ During/ End**	**Crisis**	**Start/ During/ End**
Intercept	0.657	0.642	0.661	0.652	0.642	0.615	0.663	0.657	0.652	0.639
	[**3.38**]	[**3.29**]	[**3.42**]	[**3.38**]	[**3.33**]	[**3.18**]	[**3.42**]	[**3.40**]	[**3.40**]	[**3.35**]
General										
Start		-0.437		-0.071		-0.355		-0.300		0.075
		[**-2.68**]		[-0.29]		[**-2.02**]		[-1.30]		[0.24]
Crisis/During	-0.129	-0.139	0.108	0.133	-0.047	-0.011	0.051	0.183	0.266	0.206
	[**-2.06**]	[**-1.67**]	[0.98]	[0.98]	[-0.66]	[-0.12]	[0.37]	[0.64]	[**1.71**]	[0.68]
End		0.266		0.224		0.194		0.344		0.404
		[1.55]		[0.90]		[1.01]		[1.50]		[1.35]
Grave Threat										
Start				-0.662						-0.611
				[**-1.76**]						[-1.60]
Crisis/During			-0.399	-0.441					-0.355	-0.411
			[**-2.73**]	[**-2.44**]					[**-2.40**]	[**-2.25**]
End				0.030						0.032
				0.09						[0.09]
Major Power										
Start						-0.404				-0.396
						[-0.98]				[-0.96]
Crisis/During					-0.316	-0.427			-0.2698	-0.378
					[**-2.36**]	[**-2.47**]			[**-2.02**]	[**-2.18**]
End						0.258				0.339
						[0.74]				[0.90]
Long										
Start								-0.401		-0.284
								[-1.11]		[-0.79]
Crisis/During							-0.238	-0.346	-0.151	-0.189
							[-1.49]	[-1.15]	[-0.95]	[-0.61]
End								-0.249		-0.203
								[-0.76]		[-0.63]

Notes: Estimation results for the equation 1 in the text: $r_t^{world} = \mu + \alpha_1 Crisis_t + \varepsilon_t$ where $Crisis_t$ is the total number of crises occurring in month t. and estimation results for the regression 2: $r_t^{world} = \mu + \alpha_1 Start_t + \alpha_2 During_t + \alpha_3 End_t + \varepsilon_t$ where $Start_t$ and End_t denote the number of crises that start and end in month *t*, respectively. $During_t$ is total number of crises that occur in month *t* excluding all crises that start or end in that month. We use the crisis-dimension variables described in Table 1: $GraveThreat_t$, $MajorPower_t$ and $Long_t$ and include these in equation 1 and equation 2 as additional variable. T-values are reported in square brackets and based on heteroscedasticity consistent standard errors. T-values in bold denote significance at the ten percent level.

Table 6. Crisis effects in stock returns of individual countries.

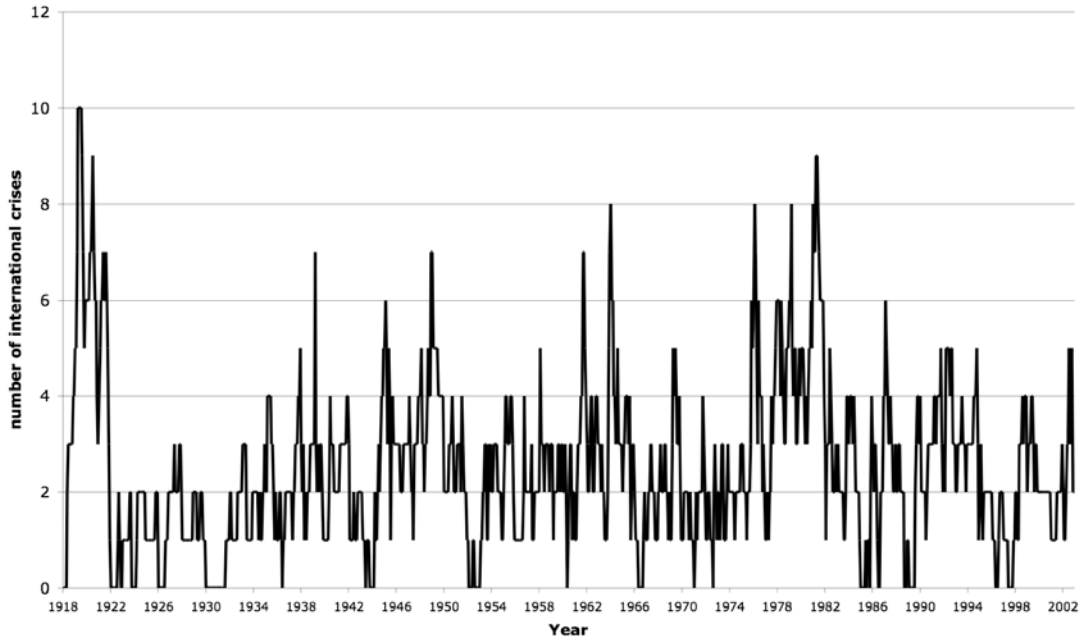
Country	Crisis (%)	Start (%)	During (%)	End (%)	Crisis Other (%)	Start Other (%)	During Other (%)	End Other (%)
Australia	-2.68	-3.71	-3.45	-0.59	0.04	-0.18	0.15	-0.07
Austria	-0.10	-4.28	0.00	3.61	-0.04	-0.06	-0.16	0.09
Belgium	-1.15	-1.46	-2.07	1.50	-0.01	-0.34	0.15	-0.14
Canada	-0.74	-4.24	-0.28	2.72	-0.16	-0.10	-0.13	-0.43
Finland	-5.78	-7.94	-10.75	-1.44	0.18	-0.58	0.15	0.79
France	-0.21	0.22	-0.05	-0.65	0.24	0.24	0.35	-0.36
Germany	2.17	-1.41	2.14	4.94	-0.31	-0.28	-0.40	0.06
India	-0.79	-2.05	-0.92	0.85	-0.11	-0.79	0.19	0.29
Italy	0.63	-0.83	0.59	2.31	0.02	-0.78	0.11	0.19
Japan	0.19	0.70	0.31	-0.65	0.19	-0.62	0.52	0.21
Netherlands	-0.51	-0.09	-0.96	1.49	-0.07	-0.50	0.03	-0.05
South Africa	-2.66	-6.06	-1.00	0.30	-0.13	-0.37	-0.13	0.01
Spain	-0.54	-3.87	-0.54	1.58	0.06	0.14	0.04	0.06
Sweden	-2.06	-0.76	-3.42	1.49	0.09	-0.54	0.31	-0.04
UK	-0.44	-0.76	0.69	-1.80	-0.13	-0.07	-0.23	-0.10
US	-0.01	-0.84	0.11	0.13	-0.17	-0.62	-0.36	0.09
Mean	-0.92	-2.34	-1.23	0.99	-0.02	-0.34	0.04	0.04
T-stat	**-2.08**	**-3.84**	**-1.68**	**2.14**	-0.55	**-4.31**	0.57	0.53
T-stat*	-1.51	**-3.03**	**-1.68**	**2.29**				

Notes: Estimates of the equations: $r_{i,t} = \mu + \alpha_1 Crisis_{i,t} + \alpha_2 CrisisOther_{i,t} + \varepsilon_{i,t}$ and

$$r_{i,t} = \mu + \alpha_1 Start_{i,t} + \alpha_2 During_{i,t} + \alpha_3 End_{i,t} + \alpha_4 StartO_{i,t} + \alpha_5 DuringO_{i,t} + \alpha_6 EndO_{i,t} + \varepsilon_{i,t}$$

where $r_{i,t}$ is the stock market return in country i in month t. $Crisis_{i,t}$ refers to the number of Crisis in which country i was a crisis-actor. $CrisisOther_{i,t}$ refers to the number of crises in month t involving countries other than country i. Similarly $Start_{i,t}$, $During_{i,t}$ and $End_{i,t}$ refer to the number of international crises in month t in which country i was a crisis-actor and $StartO_{i,t}$, $DuringO_{i,t}$ *and* $EndO_{i,t}$ refer to the number of crises in month t involving countries other than country i. All results are reported as percentage returns. At the bottom of the table are mean coefficients (averaged across the 16 countries), and t-statistics based on the standard errors across the 16 countries. t* are calculated by first regressing the country return on the world market return. The residual of this regression is used in equation 3, and the alternative t-statistic, t*, is based on the mean and standard error across the 16 countries. T-values in bold denote significance at the ten percent level.

Figure 1. Monthly number of international crises (1918-2002).



Data source: International Crises Behavior (www.icbnet.org).