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Abstract

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Keywords

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G15

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Armageddon and the Stock Market: US, Canadian and Mexican Market Responses to the 1962 Cuban Missile Crisis*

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The threat of nuclear annihilation has never been higher than in 1962, when US President Kennedy and Soviet Premier Khruschev engaged in brinkmanship over the placement of Soviet missiles in Cuba during October 16-28. Although the resolution of the crisis was followed by a sustained recovery in the US, Canadian and Mexican stock markets, the stock market impact of the crisis itself, at first glance, seems relatively limited. Notwithstanding the fact that empirical analysis of 1962 US market data reveal a significant break on October 23, 1962, which is the day after President Kennedy's television address about the Cuban Missile Crisis, the drop on this day was smaller than prior one day declines seen in the earlier part of the year. When we focus on the 1% left tail of the distribution of stock returns, that is, just the very largest and least probable negative returns, a different story emerges, however. US uncertainty is now seen to have a significant negative impact on returns across each of the US, Canadian and Mexican markets. Moreover, the size of the negative response to the rise in uncertainty is comparable in all three cases notwithstanding the fact the pre-crisis Mexican stock market trajectory had been very different from that seen in the United States and Canada.

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> [T]he construction of bases for the launching of offensive weapons … constitutes a threat to most of the cities of North America including our major cities in Canada.
>
> (Canadian Prime Minister Diefenbaker, October 22, 1962)[1]

> The Cuban crisis sent stock prices skidding on the world's major stock markets yesterday. At Toronto and New York, losses were the sharpest in four months. About the only strength was in issues related to defense, with buying kindled by belief defense contracts might be given to some companies …
>
> (Toronto *Globe and Mail*, October 24, 1962)

> I doubt [the diplomatic way] is going to be successful. The other way is, I think, a combination of an air strike and probably invasion, which means that we would have to carry out both of those with the prospect that they [the missiles] might be fired.
>
> (President Kennedy, Oval Office, October 26, 1962)[2]

1. Introduction

Although the threat of nuclear annihilation has remained ever present since the development of atomic weapons in the 1940s, the closest call yet seen was during October 16-28, 1962. At this time US President Kennedy and Soviet Premier Khruschev engaged in ultimate stakes brinkmanship over the placement of Soviet missiles in Cuba that raised alarm not only in neighboring nations like Canada but indeed the whole world. Dixit and Skeath (1999, p. 457) characterize this Cuban Missile Crisis episode as a game of "chicken in real time.[3] Even more worryingly, it has since become clear that this was also a game of chicken played with

[1] Quoted in McKercher (2011, pp. 339-340).
[2] Quotation taken from May and Zelikow (1997, p. 476).
[3] See Kennedy (1968) for an insider perspective on the build-up of the crisis; while the recordings transcribed in May and Zelikow (1997) feature the actual words of many of the key players in the crisis.

incomplete information.[4] The accompanying uncertainty is likely to have been significant, as we shall see below. Academic interest in the economic and financial impact of uncertainty has experienced a resurgence in response to the recent financial crises in the US and the Eurozone (see, *inter alia*, Kozeniauskas et. al., 2016; Koslowski et. al., 2018; Altig et al., 2020).

The stock market effects of the Cuban Missile Crisis can also be thought of in terms of the broader question of how political risk is factored into market pricing. This involves stocks and bonds issued by less established and less stable regimes typically selling at a discount relative to their US equivalents. US safe haven status has survived major pressures like the global financial crisis and the coronavirus. However, what happens when the country's very existence is in question as was true in October 1962? We would expect a concomitant increase in uncertainty to be manifested in market trading at this time and the paper's empirical work offers some support for this. On the other hand, it has to be said the overall magnitude of the market moves does not seem to match the extremity of the danger that far exceeded anything seen since, including during the attacks of September 11, 2001. As discussed further below, this may reflect limitations on the extent to which markets can price in a risk under conditions of uncertainty as extreme as nuclear annihilation – and the 1962 case can be thought of as adding an extreme bounds test on top of what can be gleaned from market reactions to more recent shocks.

Although the Cuban Missile Crisis itself, like the Cold War in which it erupted, are long past, it would be a mistake to assume that nothing like it could happen again. The Cuban Missile Crisis had been followed in August 1963 by a partial test-ban treaty between the Soviet Union and the United States amidst growing acceptance of the principle of mutually assured

[4] US intelligence not only greatly underestimated the number of Soviet troops in Cuba (10,000 vs. 43,000) but also was unaware that the Soviet missiles in Cuba were accompanied by additional tactical nuclear weapons with a payload similar to that unleashed on Hiroshima in 1945 – weapons that would have been unleashed with horrific consequences had the United States followed through with its invasion plans in 1962 (see Plokhy, 2021, pp. 1-2).

destruction. Successive bilateral agreements led up to the 1987 Intermediate-Range Nuclear Forces Treaty. However, even prior to Russian and US withdrawal from this treaty in 2019, limits on the scale of US missile deployments ended after US withdrawal from the Anti-Ballistic Missile Treaty in 2002 (Acton, 2021). An even more fundamental shift concerns how the nuclear balance has been massively disrupted by the emergence of more and more nuclear arsenals around the world, including those of not only Iran and North Korea but also China (and its 2021 tests of an orbital nuclear delivery system). Plokhy (2021, p. 362) concludes that "we are back to a period resembling the one that preceded the Cuban Missile Crisis, when there is no generally recognized 'balance of terror' …"[5]

Whatever gravity and importance we may attribute to the Cuban Missile Crisis, this does not seem at first glance to have been shared by contemporary stock market participants. For example, McCrum (2018), in observing that the overall US market reaction was limited to "[a]bout a 7 per cent drop, mostly recovered by the time Khrushchev blinked," concludes that this episode simply demonstrates that "the stock market isn't the best way to assess existential risk." We show in this paper, however, that the threat of nuclear war did, in fact, elicit significant and meaningful market responses not only in the United States but also in Canada and Mexico.

The S&P 500 actually began falling gradually well prior to the October crisis period, and leaked news on rising nuclear tensions and the Cuba situation may well have factored into the market drop seen earlier in 1962. [6] The trickle of 'bad' news began in January 1962 when the

[5] And it may well be even worse than that characterization implies given that one has to wonder how much scope there would be for pulling off today the kind of last-minute window-ledge agreement once secured between Kennedy and Khruschev.

[6] Other than a positive bump, around the time Kennedy was elected, the fall in the stock market predates the start of the Kennedy administration. The NBER records a recession in 1960-61, as well as two other recessions during the 1950s. See https://www.nber.org/cycles.html.

Organization of American States expelled Cuba and soon followed up by imposing a trade embargo. News by the late summer of 1962 that the Soviet Union and Cuba had reached an arms agreement was itself preceded by the U.S. State department holding a briefing about an arms build-up in Cuba. As noted by Bloom (2009), the October 1962 crisis was still clearly associated with heightened market uncertainty, however, and the resolution of the crisis was immediately followed by a renewed uptrend not only in the United States but also in the neighboring Canadian and Mexican markets. The subsequent market rise in many ways parallels the one seen shortly after the 9-11 terrorist attacks in 2001.

This paper's empirical work focuses primarily on the uncertainty effects, demonstrating consistently significant effects of rising US uncertainty on returns across each of the US, Canadian and, to a lesser extent, Mexican markets over the 1% left tail in the distribution of stock returns. This tail represents the least probable portion of the distribution of stock returns and the one most susceptible to uncertainty. Our findings suggest that the Cuban Missile Crisis did, in fact, heighten the impact of market uncertainty in terms of its contribution to the largest negative stock market returns. Although the US stock market did not react as negatively, *ex ante*, as during some other major events in financial history, the shock impact in 1962 was likely lessened by nuclear doomsday scenarios already being such a familiar sign of the times. Scientists had been publishing their famous "doomsday clock" ever since the first series of nuclear tests at Bikini Atoll in July 1946, which was followed by an arms race between the United States and the Soviet Union and rising levels of nuclear testing that actually peaked in 1961 – the year before the Cuban Missile Crisis began.[7]

[7] We relegate to an appendix the "doomsday clock" which reached 2 minutes before midnight in 1953 before rising to 7 minutes before midnight in 1960. It would fall to 12 minutes before midnight in 1963, before remaining closer to the doomsday scenario every year except 1991 and 1995. We also relegate to the appendix a chart on post-World War II nuclear tests.

Whereas the uncertainty in question could have been of the Knightian kind, that is unquantifiable, it certainly appears that markets assigned a very small risk or likelihood to the crisis leading to an actual nuclear exchange despite President Kennedy's pessimism at the height of the Cuban Missile Crisis. Gallup polls around the time of the crisis and soon after (Smith 2003) suggest that, despite the public being very aware of tensions with Cuba and the financial implications, and a majority (59%) believing that Cuba was a threat to world peace, the danger of a war was nevertheless seen to be very low (5% by February 1963).

The rest of the paper is organized as follows. The next section relates the Cuban Missile Crisis to the literature on other catastrophic events. We then document the impact of the crisis on stock markets in the United States, Canada and Mexico. Canada is, of course, a close ally and largest trading partner. Mexico, at the time, was far less economically integrated with the United States than is true today but shares a long border as well as having historical links with Cuba. In section 4, we present some empirical evidence relying not only on aggregate stock market performance but also, in the US case, on a sample of individual stocks. Given the singular nature of the Cuban Missile Crisis our approach is empirically eclectic though we rely heavily on the quantile regression approach as this technique seems the most appropriate one under the circumstances. We end with a summary and some conclusions.

2. The Cuban Missile Crisis in Perspective

Arthur Schlesinger, a special assistant of President Kennedy, in the foreword of the 1999 edition of Robert Kennedy's (1968) memoir of the event, referred to the Cuban Missile Crisis as the "…the most dangerous event in human history." Although the evolution of the Cuban Missile Crisis is laid out in the Appendix, the rapid escalation of tensions after the initial detection of the

Soviet missiles was highlighted by the fact that, on Friday, October 26, "President Kennedy ordered the State Department to proceed with preparation for a crash program on civil government in Cuba to be established after the invasion and occupation of that country" (Kennedy, 1968, p. 65).[8]

The Cuban Missile Crisis remains distinct from more recent catastrophic events like the terrorist attacks of September 11, 2001 for three main reasons. First, the scale of the threat remains unparalleled. Second, it involved reactions to an event that thankfully never occurred. Third, and perhaps most importantly, it was less an unforeseen event than an escalation of tensions and dangers that had been omnipresent since the launch of the nuclear age and had been on the rise ever since Fidel Castro ousted Cuban President Batista in 1959. This created a Soviet ally less than one hundred miles away from America's shores and was followed not only by the failed "Bay of Pigs" invasion in 1961 but also an increasingly deteriorating situation throughout 1962 (as detailed in the Appendix).

There has been no shortage of more recent shocks impacting world financial markets, including nuclear accidents such as Three Mile Island in 1979 and Chernobyl in 1986 and a long list of terrorist attacks before and after those of 2001. Scholtens and Steensma (2002) use data form Italy, Netherlands and Sweden as well as the United States to examine stock market reactions to a range of major shocks starting with Chernobyl in 1986 and ending with the September 11, 2001 attacks. These encompass earlier terrorist attacks like the 1993 World Trade Center bombing and 1995 Oklahoma bombing as well as such events as the Gulf War in 1990, the Soviet coup in 1991 and the Kosovo war in 1999. Event study analysis suggests significant

[8] Meanwhile, Cuban exile support for a new invasion and calls for military action had already been reported in the Mexico City press (Excelsior, October 23, 1962). The rising fears of war were allayed only by the conciliatory message from Premier Khruschev that was broadcast on Sunday, October 28, just as "prayers and sermons for peace were being offered in many churches in the United States" (Dixit and Skeath, 1999, p. 443).

across the board short-term negative reactions for only three of the ten events: the 1991 Soviet coup, the 1995 Oklahoma bombing, and the 2001 attacks. Meanwhile, significant reactions to Chernobyl were seen in Netherlands and Sweden but not in Italy and the United States. This is in line with the immediate danger of fallout from the nuclear reactor being concentrated in northern Europe – just as the Cuban Missile Crisis threat was itself more immediate for Canada, Mexico and the United States than for other nations.

In examining market reactions to a wide range to terrorist incidents between 1991 and 2010, Goel, Cagle and Shawky (2017) find no lasting impacts on equity or bond market returns outside of the September 11, 2001 case. As with Scholtens and Steensma (2002), this suggests that headline-grabbing events and significant loss of life did not necessarily have major stock market implications. Even with the 2001 attacks, Carter and Simkins (2004) find evidence of rational pricing persisting through the emotions of the time, with their cross-sectional results suggesting that the market distinguished between airlines according to their level of cash reserves and perceived ability to survive the initial downturn in air travel. Similarly, with regard to nuclear accidents, stock market punishment seems to have been quite targeted in nature. Following the Three Mile Island incident, for example, Hill and Schneewis (1983) find that negative abnormal returns experienced by nuclear-based public utility firms far outweighed those of their non-nuclear-based counterparts. With regard to Chernobyl, Kaira, Henderson and Raines (1993) identify only small and transitory effects on most utilities but more pronounced effects on a group with partial nuclear capacity that included many firms committed to large new nuclear projects that had not yet been approved – hence implying especially high vulnerability to any regulatory backlash against expanded reliance on nuclear power

September 11, 2001 is perhaps the incident most like the Cuban Missile Crisis insofar as it directly threatened not just the finances of market participants but, to some extent, their very survival. Many US and non-US financial firms faced a personal toll from the destruction of the Trade Towers and this was accompanied by fears that this could be just the beginning of an ongoing wave of further attacks – prompting, among other things, the establishment of Homeland Security in the following year. On the other hand, it remains distinct from the Cuban Missile Crisis in terms of being a more truly unanticipated event as well as, relative to possible nuclear annihilation, still having to be considered more limited in potential scope. One objective indicator of the perceived impact of the Cuban Missile Crisis on mortality risk lies in the dramatic increase in reproductive activities in US states closer to Cuba and those with more military installations. Raschky and Wang (2017) identify significant increases in the general fertility rate in states closer to Cuba nine months after the end of the Cuban Missile Crisis, including a Florida increase of nearly 0.2 children per thousand women. This is "consistent with the hypothesis that individuals discount the future heavily and increase leisure and sexual activities when facing high-level mortality risks …" (Rashky and Wang, 2017, p. 5727).,

The question remains as to whether stock markets could truly have the capacity to properly incorporate something as final as nuclear Armageddon. Although not nuclear in nature, countries like France and Poland nevertheless essentially faced extinction as sovereign nations in 1940 – and yet the stock market reactions were surprisingly modest, with the main market indices declining in each case by less than 25% from their prior peaks (Bialkowski and Ronn, 2017). Similarly, the market reactions in 1962, while significant, did not appear to truly discount the (perhaps inherently unthinkable) worst-case scenario. During this period the media did not appear to convey any undue alarm about the emerging crisis notwithstanding the fact that the

evolving tensions between the United States and the Soviet Union frequently made the headlines in newspapers such as the *New York Times*.[9] Indeed, it is only on the day of President Kennedy's speech that the *Times* published an account of how much of what was happening was being kept from the public (*New York Times*, 1962). Until that time, reports emphasized the diplomatic route being taken and reported the Soviet claim that the missiles in Cuba were for defensive purposes alone.[10]

One explanation for the inability of the stock market to properly assess the potential impact of low probability, but potentially cataclysmic, events is the challenge of dealing with uncertainty. The literature dealing with economic uncertainty has mushroomed in recent years but there is currently nothing approaching a consensus of its proximate determinants. Moreover, uncertainty comes in several forms and, although political components are not always considered, this is changing (see, for example, Kozeniauskas, et. al., 2016; Castelnuovo, 2018; and Dai and Zhang, 2019, for recent surveys). Interestingly, in empirical exercises, uncertainty is often associated with disagreement among individuals over, for example, the economic outlook (Orlik and Veldkamp, 2015; Koslowski et. al., 2018; and Koslowski et. al., 2020). One take-away from this literature is that rare events can have persistent macroeconomic effects. Nevertheless, for the reasons outlined above, it is difficult to conceive of the Cuban Missile

[9] The mixed messages about the impact of the crisis on stock markets were echoed in a New York Times headline, the day after President Kennedy's speech: "Stocks Plunge Early On Crisis, but Rally" (Rutter, 1962).
[10] Aside from the United States itself, Canada was likely the most directly implicated in the crisis not only because of the important trading relationship between the two countries but also thanks to the military links under NORAD (North American Aerospace Defense Command). Canadian political and military involvement in the Cuban Missile Crisis is explained in Haydon's (1993) first-hand account, while Granatstein (1986) provides another historical overview of Canada's role in the crisis. In contrast, Mexico remained publicly more neutral during the Cuban Missile Crisis, even if its sympathies were allegedly biased in favor of Cuba's position. Mexico retained diplomatic relations with Cuba at the time, as did Canada – and the US government was unhappy that Canada's foreign policy did not fully mirror that of the United States.

Crisis as a true 'black swan' event. Hence, it would be surprising if uncertainty was left untouched by the events of 1962.

3. Documenting the Stock Market Reactions to the Crisis

Although the Cuban Missile Crisis naturally had worldwide ramifications, countries most clearly in the eye of the storm remained the United States and its northern and southern neighbors. Daily data on the US S&P 500 index from 1960-1965 are drawn from *Global Financial Data.* Daily data on the Canadian and Mexican stock market indices had to be hand-collected from contemporary newspapers, however. For Canada, data on the TSX Composite index have been merged with earlier data from the TSE 20 index, all drawn from the Toronto *Globe and Mail.*[11] Daily data on Mexico's *Índice de Precios y Cotizaciones* (IPC) are from individual past issues of the Mexico City newspaper *Excelsior*.

Comparative trends in the three market indices over 1960-1965 are displayed in the top portion of Figure 1.[12] This 'long' view of stock market performance for the period 1960 to 1965 covers a sample period selected not only because of data availability but also to highlight the striking rise in stock market indices in all three countries post-Cuban Missile Crisis.[13] Subsequent unrelated major events, such as the full onset of the Vietnam war and the fixing of the gold price to the US dollar, would cloud the identification of any link with the events of October 1962 beyond 1965. Although the Cuban Missile Crisis did not lead to a collapse in

[11] This was facilitated by a period of overlap, over which both indices were provided, prior to the end of the TSE 20 index on November 4, 1963.

[12] Although the focus of the empirical analysis below is on uncertainty so that the 4th moment of the distribution of returns is relevant (see below) it is also worth pointing out that, in 1962, returns in all three markets are negatively skewed which is understandable given how eventful the year was. For the 1962-65 period, US returns remain slightly more negatively skewed than in 1962 while returns in Canada and Mexico are positively skewed. Estimates of skewness are relegated to the appendix.

[13] The steady rise in stock prices is interrupted by two significant events: the assassination of JFK in November 1963, and the United States' growing involvement in Vietnam.

stock prices in the US in the months leading up to the key 'thirteen days' emphasized by Kennedy (1968), the data reveal a reversal from the steady rise that began soon after the election of JFK. Elsewhere in North America, stock market performance in Canada roughly parallels that of the United States whereas Mexican stock price trends are quite different from the other two countries until the end of the Cuban Missile Crisis in late 1962.[14] Nevertheless, all three markets share a pronounced and sustained rise after the crisis was finally resolved, with Monday, October 29, 1962 marking the first trading after fears of nuclear war had largely banished over the preceding weekend.

The middle of Figure 1 presents a different view, focusing on the events in 1962 alone. As shown in the chronology (see Appendix), the principal events surrounding the nuclear tensions that peaked in October 1962 began early in that year before being largely dissipated by December. The vertical dashed lines highlight some of the most salient events during this period with the peak being clearly indicated by the many dashed vertical lines beginning in August and culminating in October. The differential behavior of stock prices between the US and Canada on the one hand and Mexico on the other is even more striking than shown in the top portion of Figure 1. Stock prices in Mexico display remarkable stability even as stock prices in Canada and the United States enter into a substantial slide that predates the crisis. Indeed, US stock returns fell by more in May and June 1962 than they did on October 23 and by more than on the day of President Kennedy's assassination in November 1963 (not shown; see appendix). The US market had been declining well before the Cuban Missile Crisis in an extended decline that

[14] Eun and Sabherwal (2003) demonstrate cointegration between prices on the Toronto and New York exchanges and identify feedback to and from the two markets in terms of price changes. Although their study is for a short period in 1998 there is good reason to believe that links of this kind are long-standing (see also Chouimard and D'Souza (2003-2004).

peaked in late May 1962. Even though the May 28, 1962 paper loss exceeded even that seen on October 28, 1929, Brooks (2014, p. 29) in his first-hand account states that the actual "cause of the crisis remains unfathomable." In any event, panic selling was followed by a partial recovery of the US market before renewed decline coinciding with the onset of the October Cuban Missile Crisis.

The Canadian market reveals a similar pattern to that seen in the US case. The Mexican market, although differing in that it featured consistent gains in the period leading up to the crisis, shared the subsequent downturn around the time of the crisis. Crisis effects seemingly remain elusive across both the Canadian and Mexican markets. There were eleven separate days on which Canadian stock returns fell by larger amounts than what was seen at the height of the Cuban Missile Crisis, including the day of the Kennedy assassination. Meanwhile, none of the key thirteen crisis days even make the top 20 negative stock returns in Mexico. Indeed, Mexican stock returns actually rose going into the close on October 23, 1962 (see the appendix).

The bottom of Figure 1 highlights the relative stability of the evolution of stock prices in Canada vs. the United States compared with the gap between the US and Mexican stock prices. Although these differences were already visually suggested in the middle portion of Figure 1, the dramatic departures during the crisis period are highlighted by the shaded area.

Figure 2 shows stock returns for 38 stocks on the NYSE, covering a broad range of firms and industries in the US economy possibly directly or indirectly impact by the Cuban Missile Crisis, during the key thirteen days. The following section provides additional details. Some stocks, including such oil and steel stocks as Barber, Bethlehem and Continental, actually rose in response to the President's speech. However, 31 or 38 stocks remained stable or declined on October 23, 1962 relative to the previous day's performance.

Meanwhile, US Treasury data, available since 1962 only and shown in Figure 3, display relative stability during the crisis broken, however, by some sharp one day rises, especially in the 10Y-6M spread. Once the crisis passed, the spreads fell sharply except for the 10Y5Y spread. Soon after the crisis, spreads began to fall gradually over the period ending in December 1965 (at which time a sharper decline is seen). If financial uncertainty is linked to political uncertainty, then the fall in spreads seems to signal a fall in political uncertainty after the crisis. There is a modest but noticeable rise in all spreads in the weeks leading up to the October Cuba Missile Crisis.

A qualification is that, well prior to the most troubling public statements about ongoing tensions between the United States and the Soviet Union, news stories about the build-up of Soviet armaments in Cuba had been leaked to the US press. There is no way to determine whether the looming Cuban Missile Crisis explains the downturn in US and Canadian stock prices beginning in the summer of 1962. Nevertheless, as contemporary observer Brooks (2014) had observed, there is no obvious alternative candidate for the visible decline in the two indices. Furthermore, as noted earlier, Cuba had been an ongoing source of political and military tensions ever since Fidel Castro seized power there in 1959. President Kennedy had himself authorized the ill-fated "Bay of Pigs" invasion of April 1961 less than three months after his inauguration.[15] The October crisis was quite possibly seen as more a deepening of existing strains than a true bolt from the blue.[16]

[15] Dube, Kaplan and Naidu (2011) include this invasion plan in their analysis of market responses to coup attempts, with the reaction to the plan's authorization implying some belief that it could actually have been successful.
[16] In this regard, Huh and Pyun (2018) identify a significant stock market reaction to North Korea's first nuclear test, but no significant impact of subsequent nuclear-related events.

With the US stock market already in a relatively depressed state by the time the crisis peaked in October 1962,[17] additional downward pressure may itself have been partially countered by the aforementioned buying of defense-related stocks. Another consideration is that, whereas selling stocks short normally offers a way to profit from a negative outcome actually coming to pass, it is not clear that this really works in the case of the Cuban Missile Crisis where the unfavorable result could well mean near-total obliteration. It should certainly have led to elevated uncertainty levels, however, as explored in the empirical work set out below.

We also examined the behavior of commodity prices over the 1960-65 period based on data reported in daily issues of the *New York Times*. However, owing to a crucial gap between the end of November 1962 and March 1963, we opted not to include the series in the econometric estimation reported in the next section. Figure 4 displays the behavior of some commodity prices around the height of the Cuban Missile Crisis. Also highlighted is the day after President Kennedy's speech to the nation and the world. While the overall index does suggest a surge the day of the speech and the next, this appears to have mostly been driven by a rise in food and related agricultural prices. This is followed by a downward trend – and we see little information in commodity prices not already incorporated in the individual stock analysis.[18]

4. Empirical Methodology

At least three challenges confront researchers investigating the Cuban Missile Crisis period from an econometric perspective. First, the events that took place in October are among

[17] As Rutter (1962) noted in the *New York Times* on October 23rd "An already battered stock market…"
[18] We relegate to the appendix a plot of the entire available sample leaving out a gap for the missing data. Most commodity prices seem to have jumped between the end of November 1962 and March 1963. By 1963, the economy was beginning to recover quickly from the earlier recession. Hence, it is difficult to determine how much of any increase in commodity prices was due to the crisis itself, relief that it had ended peacefully, or the incipient economic recovery.

the rarest of events one can imagine. Clearly, it is difficult to compare the threat of a nuclear strike with other major economic or political events. Second, although we can date precisely when President Kennedy addressed the nation and told the world about the unfolding crisis, it is clear that the thirteen days in October represents the culmination of events that took place during the calendar year 1962 and, if historians are correct, did not end immediately with the announcement of the withdrawal of missiles at the end of October of that year. Nevertheless, based on the historical record, it is appropriate to define the October 16-28, 1962 period as the period of the crisis. Third, there are only a small number of time series available at the daily frequency covering this period. Accordingly, we proceed in steps and rely on a variety of econometric techniques and specifications with the aim of generating a robust set of findings.[19]

We begin by asking whether daily stock returns during the period shown in Figure 1 are subject to structural breaks and whether these can be associated with the crisis. To do so, we estimate specifications for aggregate stock prices as well as prices for individual stocks. More formally, we can write

$$R_{i,t} = \alpha_i + \beta R_{i,t-1} + \delta KURT_{i,t} + \theta D_t + \gamma Z_t + \varepsilon_{it} \qquad (1)$$

where R is the daily stock return, calculated as 100 times the log change in the indices plotted in Figure 1; KURT is the 3-day moving kurtosis of stock returns; Z are controls; D is a dummy variable that captures a structural break, including the Cuban Missile Crisis; and ε is the residual term.[20] The index *i* allows for the possibility that equation (1) is estimated for a cross-section of

[19] A reviewer suggested that we conduct an event study. In principle, this is feasible except that since only a limited amount of data at the daily frequency are available, and none at the intra-daily frequency, we cannot exploit the technique to its fullest to evaluate the impact of Kennedy's speech on stock markets the following morning. One advantage of the time series approach is that a more historical perspective can be brought to bear on the data. On the advantages and challenges of relying on the event study approach, MacKinlay's (1997) survey remains useful.

[20] It is not uncommon in empirical tests of stock market behavior at the daily frequency to consider the day of, the day before and day after an event as the ones of interest. Hence, the choice of a 3-day window. Given the brevity of actual crisis period considered, a longer window reduces considerably the effective number of observations while a

individual stock prices and α_i are fixed effects for individual stocks or sectors of the economy. An alternative version of (1) using market indices, thereby allowing *i* to be suppressed, produces comparable results (see below). The timing of the break can be imposed based on a chronology of events (see appendix) or we can let the data speak for themselves. Both types of breaks are considered. While we want to let the data to be able to speak for themselves, we do have historical guidance concerning the timing of key events, notably the timing of the thirteen days of the Cuban missile crisis (October 16-28, 1962). Moreover, given the potential significance of the break we opt for a dummy that generates an intercept shift, that is, one that results potentially in a permanent change in the remaining coefficients in the equation. One would expect such a reaction to a unique event like the Cuba Missile Crisis.

Unfortunately, we do not have daily data with which to extract an empirical measure of uncertainty as there are no futures indices or expected forward markets prices over the 1960-1965 period. Instead, we use a measure of kurtosis as a representation of uncertainty since this statistic provides a numerical indicator of the thickness of the tails of a distribution and, hence, the likelihood of rare events. In finance this metric is often used to proxy uncertainty although it may not be ideal under all circumstances (e.g., see Rogers and Siklos, 2003; Jurado et. al., 2015).

Other controls are captured by Z_t and these variables for other events unrelated to the crisis and other determinants of stock returns. One variable that frequently appears in the literature concerns term spreads[21] and one such term spread is shown in Figure 3.[22] The Bai-Perron (1998, 2003a, 2003b) test is then used to endogenously obtain estimates of the timing and

shorter window may cut off periods when markets anticipated or reacted to events. Clearly, there is always some arbitrariness in such choices.

[21] It is beyond the scope of this paper to survey the links between stock returns, economic activity and term spreads. However, see, for example, Bauer and Mertens (2018) who provide a brief summary of the literature and conclude that "[T]he term spread…is a strikingly accurate predictor of future economic activity."

[22] Comparable spreads for Canada and Mexico are not available. We used US spreads in the regressions for Canadian and Mexican stock returns but our conclusions are unaffected.

number of structural breaks. A drawback of this testing procedure is that breaks are assumed to occur on a particular day and there is no test for breaks with durations that exceed one day in our case. Another issue is that dummies defined according to historical accounts effectively treat each day with the same weight. However, certain events, such as President Kennedy's speech to the nation, are likely to be more salient as far as financial markets are concerned than others on neighboring days.

Next, in a second step, we estimate a version of equation (1) for only for the tail distribution of stock returns, that is, for the portion of the distribution where the probability of occurrence is lowest. It is the left tail that is relevant here since a potentially disastrous event like the Cuban Missile Crisis would be expected to generate a negative return. Although we know that events such as the Cuban Missile Crisis are rare, it is not obvious over which portion of the distribution of returns we should limit our estimates. We considered a few alternatives, but the results discussed below are estimated for the 1% and 10% left tail of the distribution of returns.[23] As a result, the quantile regression method (Koenker, 2005) seems well-suited to examine the issue under investigation.[24] This results in a specification of the form:

$$Q_{R,t}(\tau|KURT) = \alpha(\tau) + \beta R_{t-1}(\tau) + \delta KURT(\tau)_t + \theta D(\tau)_t + \gamma Z(\tau)_t + F_{\varepsilon}^{-1}(\tau) \qquad (2)$$

[23] Clearly, the smaller the portion of the distribution examined the 'rarer' the event that is contemplated. It is, of course, conceivable that some firms in the defense industry might 'benefit' from the crisis though it is hard to see how when the consequences are potentially catastrophic. Besides these firms are overwhelmingly in the business of producing conventional armaments which would not be useful in the event of a nuclear strike. On balance, it seems reasonable to consider the left tail of the distribution of stock returns.

[24] There are other methodologies that one could use (e.g., extreme value theory). There is a connection between the two methodologies and one issue is whether the sampling theory for quantile regressions applies in the present case. In this connection see, for example, Chernozhukov (2005). Not everyone is convinced that special considerations apply to the empirical analysis of stock market crashes like the Great Depression or other such events. See Gabaix et. al. (2006).

where all the variables have been previously defined and Q(-) refers to the quantile function; τ the quantile over which the function is estimated; and F represents the common distribution function of the errors.

Since uncertainty is associated with volatility we also estimate, for the US case only due to data limitations, a component GARCH (1,1) model. GARCH models are, of course, ubiquitous in finance and for the modelling of stock returns. To capture the possibility that volatility persistence has both short-run and long-run components, Ding and Granger (1996), and Engle and Lee (1999) propose an extension of the GARCH(1,1) model, called a component GARCH model, to capture these effects.[25] The resulting model, omitting variables other than lagged returns, is written as follows:

$$r_t = \alpha + \beta r_{t-1} + \sqrt{h_t z_t}$$

$$h_t = q_t + \alpha(\epsilon_{t-1}^2 - q_{t-1}) + \beta(h_{t-1} - q_{t-1})$$

$$q_t = \omega + \rho(\epsilon_{t-1}^2 - h_{t-1}) + \delta(q_{t-1} - \omega)$$

where h_t models the short-run volatility response while q_t capture the long-run component. Long-run persistence is captured by the sum $\delta + \rho$ while the usual GARCH terms are given by $\alpha + \beta$.

As noted above and implied by equation (1), we also estimate a version of equations (1) and (2) for 38 individual stocks. CRSP provides daily stock return (ex dividends) data since 1925. These were selected not only because they are likely to be impacted by events such as the Cuban Missile Crisis but also due to many of these stocks being highlighted in the immediate aftermath of President Kennedy's address to the nation (details in Appendix). KURT is now replaced by an indicator of disagreement between aggregate stock returns and individual stock

[25] We also estimated other GARCH type models, including higher order GARCH models (although the existing literature overwhelmingly reporting estimates only for the GARCH(1,1) variety). Based on the AIC (see below), the CGARCH(1,1) outperforms – by small margins – the alternatives considered.

returns. More precisely, we remove the macroeconomic component of individual stock returns by subtracting the residuals obtained from a regression of aggregate stock returns (i.e., the daily returns on S&P 500) on the change in 10 year -5 year term spread. The resulting series (then squared) is meant to proxy disagreement between individual and aggregate stock returns. Since we have at our disposal volume data, we follow many others in the literature and add trading volume as an additional determinant. A dummy variable set to one to identify the Cuban Missile Crisis, is added and is the focus of interest. Fixed effects are also added.

5. Estimation Results

There are two main components to the empirical work derived from the section above. The first set of results asks whether there are any statistical breaks in stock market returns in the three countries and when, relying on equation (1). We repeat the same exercise for the individual stock returns we have collected. Uncertainty is seen as influencing returns, conditional on lagged returns and the change in interest rate spreads, and is itself proxied by the 3-day moving kurtosis of stock returns.[26] The second set empirically considers the link is between uncertainty and returns, conditioned the same way as in the breaks test, but when we examine only the very lowest left tail (i.e., highest negative returns) of the distribution of returns.

Table 1 summarizes the evidence for the timing of estimated breaks in returns at both the aggregate and at the level of individual stocks. When market returns are considered the location of breaks is a function of the chosen sample. If we instead set the dummy in equation (1) equal to one during the thirteen days of the crisis (October 16-28, 1962), none are found to be significant for all three countries and both samples (results not shown). As noted above, dummy

[26] The regressions shown only allow for US uncertainty to impact returns in the 3 countries. Substituting own market uncertainty in the Canadian and Mexican regressions does not change the conclusions.

variables defined in this manner preclude a focus on specific events that occur on a particular day, however. Accordingly, the impact on financial markets may well have dissipated over a period of time preventing the identification of effects on particular days. Nevertheless, as shown below, these estimates ignore the presence of conditional volatility in the residuals. We discuss estimation details below (see Table 2).

When individual stocks are considered a solid majority (24 of 38 stocks) do not experience a break over the 1962-1965 period. And, with only two exceptions, all breaks in stocks only take place during 1962. Moreover, all the breaks take place several months before the peak in the Cuban. Missile crisis. For Ford, NCR, and Unisys, breaks occur during the height of the crisis (i.e., the thirteen days) and on October 29, 1962 in the case of North American Sugar. Ford, of course, is a major automotive manufacturer while the other two manufactured products that would nowadays be classified as information technology. It is also worth mentioning that tensions with Cuba during 1962 competed with the Kennedy administration's battle with the steel industry – which was alleged to have been engaged in price fixing, leading to anti-trust suits in the late Spring of 1962.[27]

Table 2 show the results for market returns in the three countries considered over the full 1962-1965 sample period as well as for data for 1962 alone which, as previously explained, captures the period when tensions between Cuba and the US first emerged until the end of the year when the crisis ostensibly ended. The number of estimated breaks dictates the number of coefficient estimates obtained for each sub-sample. For example, in the US case, the previous day's return (r_{t-1}) is 0.60 and statistically significant in the first sub-sample and 0.13 and insignificant in the second sub-sample. Although no breaks are found for Mexico for the 1962-

[27] Bethlehem steel was the company likely most implicated which may explain the 1962 break. No breaks were found for the other two major steel companies in the data set (Continental, U.S. Steel).

1965 sample, significant breaks are dated June 14, 1962 for the United States; and July 24, 1962, and November 14, 1962 for Canada. There are no breaks outside 1962. Prior to the first break, a rise in uncertainty significantly reduces stock returns in both the United States and Mexico by comparable amounts. A post-break rise in uncertainty is positively related with stock returns in both the United States and Canada and, again, the coefficients are similar. Both post-break samples include the period of the Cuban Missile Crisis although the worst moments appear to have passed by mid-November 1962 when the break for Canada is estimated.

If we focus the testing on 1962 data alone (bottom portion of the Table), there is a significant US break on October 23, 1962, which is the day after Kennedy's television address about the Cuban Missile Crisis. Another US break occurs on November 14, 1962 which is the same date as the break found for Canada for the full sample (see top portion of Table 2). For Canada, the results are largely unchanged compared with the ones shown earlier, though one less break is found, while for Mexico a significant break is estimated on December 6, 1962. In general, uncertainty is seen as raising US returns, but only during the peak period of the crisis. Spillovers from US uncertainty to Canada and Mexico also largely disappear although, post-break, there is an almost 17 basis point rise in Canadian returns in response to a higher spread. A higher spread is considered indicative of improved future macroeconomic outcomes.

Equation (1) ignores the possibility, well documented in the empirical literature that estimates the determinants of stock returns, that a better model assumes conditional heteroskedasticity in some form in the residuals. Therefore, Table 3 provides estimates from a CGARCH(1,1) model justified in the previous section. Here the emphasis shifts to changes in conditional volatility. We now observe that the Cuban Missile Crisis dummy (CMC) contributes to reduce the S&P 500 stock returns by almost 40 basis points. The volatility equations indicate

not only a positive impact in short-run conditional volatility (i.e., $\alpha + \beta$) but the presence of considerable long-run volatility persistence (i.e., $\rho + \delta$).[28] Clearly, the crisis left scars on stock returns though not to the extent that accords with some priors about the impact of such events. Indeed, as shown in Figure 5 which displays the volatility in US stock returns from the CGARCH model (i.e., the CGARCH(1,1) variance series), three events stand out over the 1962-1965 period. They are: the Kennedy administration's battle with the steel industry in May 1962, the Cuban Missile Crisis in late October of the same year and, finally, the fallout from President Kennedy's assassination in November 1963.

A drawback with the results so far is that breaks are one-time events. Whereas the worst of the Cuban Missile Crisis occurred on a particular day, the actual crisis evolved over a period of days, if not months. Accordingly, Table 3 also shows the same regression as in Table 2 but now focusing solely on the behavior of returns and uncertainty in the left tails of the distribution. In particular, we focus on the 1% and 10% left tails of the distribution which contain the very largest negative returns. In this context, US uncertainty is now seen to exert a negative impact on returns in all three markets and the size of the negative response to a rise in uncertainty is comparable across the US, Canadian, and Mexican markets. Interestingly, the impact of greater uncertainty on returns is much higher at the smallest portion of left tail of the distribution (i.e., $\tau = .01$). For example, a rise in US uncertainty reduces returns by just over 100 basis points for $\tau = .01$ while the decline is 40 basis points when $\tau = .10$. Therefore, uncertainty not only reduces returns when they are relatively large and negative but the largest negative returns incur

[28] Estimates for a conventional GARCH(1,1) model yield similar results for the mean and variance equations. The latter display relatively more volatility persistence because short-run and long-run persistence are conflated. We also estimate GARCH models for individual stock returns but these, in general, fare poorly (results not shown). The AIC for the GARCH(1,1) model is 1.29 and 1.2871 for a CGARCH(1,1) model that includes a threshold. Both are slightly higher than the estimates shown in Table 3.

a much bigger drop than others. By contrast, when we examine the mean or median of the distribution (results not shown), we find that uncertainty is either unrelated to stock returns or else that the coefficients, when statistically significant (US case only), are considerably smaller. Hence, the evidence suggests that the Cuban Missile Crisis did, in fact, heighten the impact of market uncertainty in terms of its contribution to the largest negative stock market returns.

Table 4 presents the final set of results. To conserve space (detailed results are available on request) we only show the coefficient and statistical significance of the dummy variable for the thirteen days of the Cuban Missile Crisis (i.e., October 16-28, 1962), a statistical test to determine whether estimates at the 1% quantile differ from the ones at the 10% quantile, and a test whether quantile estimates at the left tail differ from ones at the upper right tails of the distribution of returns (i.e., 90% and 99% quantile). The last test provides some indication of whether there is asymmetry in the behavior of returns in both tails of the distribution.

The results suggest that the crisis depressed returns, but the effect is generally significant in the 1% left tail of the distribution. Indeed, at the 10% quantile there are several examples of the crisis raising returns. It is also overwhelmingly the case that estimates at the 1% quantile differ from the estimates at the 10% quantile. Finally, there is also considerable support for the view that stock returns in the left tail of the distribution differ from ones that would be obtained for stock that experienced the highest returns.

6. Conclusions

Although the resolution of the Cuban Missile Crisis was followed by a sustained recovery in the US, Canadian and Mexican stock markets, the initial stock market impact of the crisis itself seems rather modest even in comparison with market declines seen earlier in the year.

Empirical analysis of 1962 US stock market data does reveal a significant break on October 23, 1962, which is the day after President Kennedy's television address about the Cuban Missile Crisis. The most convincing evidence of crisis effects emerges when we focus on the 1% left tail of the distribution, however. In terms of this region of largest negative market returns, US uncertainty is now seen to have a significant negative impact on returns across each of the US, Canadian and Mexican markets. Moreover, the size of the negative response to the rise in uncertainty is very similar in all three cases notwithstanding the fact the pre-crisis Mexican stock market trajectory had been very different from that seen in the United States and Canada.

The stock market response to the Cuban Missile Crisis that we identify in this paper is significant, but its extent still seems to pale alongside the stakes at the time. This is in keeping with past findings on the relatively limited stock impact of terrorist attacks (Goel, Cagle and Gawky, 2017) and of extreme events in general (Scholtens and Steensma, 2002). Even though none of these other shocks involved the imminent threat of nuclear annihilation, there were a number of factors working to limit financial market reactions to the Cuban Missile Crisis. A particularly important distinction is that it was not a wholly unanticipated shock like the attacks of September 11, 2001 or nuclear reactor meltdowns such as Chernobyl. Perhaps more fundamentally, there was no obvious way of hedging against a negative outcome. That is, betting on a market collapse, if associated with full blown nuclear war, was likely to succeed only at the expense of one one's demise. The implication that markets may tend to underreact to prospects of the unthinkable is also in keeping with stock market behavior in countries like France and Spain prior to their occupation by Germany early in World War II. Pricing in a worst-case scenario may simply fail as this outcome starts to approach near total loss.

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Table 1: Dating Statistical Breaks in the US Stock Market Data, 1962-1965

Data	**Sample**	**US**	**Canada**	**Mexico**	
Stock Index	1962/04/01 1965/12/31	6/14/1962	7/24/1962 11/14/1962	None	Also see Table 2
Stock Index	1962/04/01 1962/12/31	**10/23/1962** 11/14/1962	7/24/1962	12/6/1962	
Sample: 1962/04/01-1965/12/31					
Company	*Break date(s)*	**Company**	*Break date(s)*	**Company**	*Break date(s)*
Amer. Motors	None	Ford	1962/7/25 **1962/10/25**	Royal Dutch	1965/2/10
Atlantic	None	GE	None	Ryerson	1962/6/27
Barber	None	Gen. Amer.	1962/6/11	Santa Fe	None
Bethlehem	1962/6/11	GM	None	Seabord	None
Boeing	1962/6/5	Granite	None	Spartans	None
Chevron	None	Kodak	None	Union Carbide	None
Chrysler	None	Lockheed	None	Unisys	1962/8/30 **1962/10/25**
Continental	None	Martin Marietta	1962/6/04	Union Pacific	1962/12/5
Curtis-Wright	None	North Amer. Sugar	**1962/10/29** 1963/5/27	US Steel	None
		NCR	1962/7/31 **1962/10/25**		
Douglas	None	Pharmacia	1962/5/14	Westinghouse	None
ESB	None	Pitney	1962/6/14	Xerox	None
Exxon-Mobil	1962/3/14 1962/6/05	Polaroid	1962/6/14	Zenith	None
Globe	None	Exxon	None		

Note: Based on equation (1). Also see Table 2 for test details. Dates shown are (yyyy/mm/dd). Breaks are for the level of daily returns for individual stocks (ex dividends) and market returns. Breaks are estimated using the Bai-Perron test for the null hypothesis of K+1 versus K sequentially determined breaks. Trimming of 5% of the sample, 1% significance level for individual stocks and 10% for market returns. HAC standard errors and covariances. A maximum of 5 breaks are allowed.

Table 2 Uncertainty, Volatility, and Aggregate Stock Returns: 1962-1965

Variable	**United States**	**Canada**	**Mexico**
Sample	1/4/1962-12/31/1965	1/4/1962-12/31/1965	1/4/1962-12/31/1965
Date of Break	6/14/1962	7/24/1962 11/14/1962	NONE
r_{t-1}	0.60(0.09)* 0.13(0.12)	0.36(0.09)* -0.47(0.10)* 0.15(0.05)*	0.01(0.06)
$USUnc_t$	-0.08(0.05)@ 0.06(0.02)*	-0.07(0.05) 0.04(0.06) 0.07(0.02)*	-0.05(0.02)*
ΔS_t	11.46(4.59)* -3.76(5.43)	-14.53(5.38)* 20.46(9.40)+ 3.45(3.76)	0.38(2.30)
R^2	0.13	0.11	0.0002
T	559	556	538
Sample	1/4/1962-12/31/1962	1/4/1962-12/31/1962	1/4/1962-12/31/1962
Date of Break	10/23/1962 11/14/1962	7/24/1962	12/06/1962
r_{t-1}	0.42(0.10)* -0.64(0.08)* -0.16(0.17)	0.36(0.12)* -0.42(0.13)*	0.04(0.09) -1.19(0.26)*

$USUnc_t$	-0.02(0.05) 0.67(0.10)* 0.19(0.06)*	-0.07(0.05) 0.09(0.05)	-0.02(0.03) -0.40(0.34)
ΔS_t	-2.28(11.17) -39.85(50.38) 6.16(9.04)	-14.54(0.13) 16.72(4.69)*	0.96(2.75) -27.38(23.56)
R^2	0.27	0.26	0.16
T	138	135	133

Notes: $r_t$is the daily return (ex dividends), *USUnc* is the 3 day moving kurtosis, $\Delta S_t$is the daily change in the 10Y-5Y interest rate spread. Structural breaks estimated using the Bai-Perron test with a trimming factor of 5%, breaks are statistically significant at the 10% level; Newey-West standard errors are reported; and the null of K+1 versus K structural breaks is specified with a maximum of 5 breaks. The only exception is for Canada for the 1962 sample where 1 break is imposed as the alternative led to 3 breaks with fewer that 15 observation in each regime. * means significant at the 1% (+5%, @ 10%) level. T is the number of observations. The number of estimated breaks dictates the number of coefficient estimates for the right hand side variables. See the text for the details.

Table 3: Tail Behavior or Returns

Variable	United States			Canada		Mexico	
	$\boldsymbol{\tau = .01}$	$\boldsymbol{\tau = .1}$	CGARCH(1,1)	$\boldsymbol{\tau = .01}$	$\boldsymbol{\tau = .1}$	$\boldsymbol{\tau = .01}$	$\boldsymbol{\tau = .1}$
r_{t-1}	0.33(0.67)	0.44(004)*	0.14(0.04)*	-0.17(0.33)	0.20(0.04)*	-0.01(0.14)	-0.01(0.07)
$USUnc_t$	-1.08(0.60)@	-0.40(0.03)*	NA	-1.28(0.41)*	-0.28(0.03)*	-1.07(0.12)*	-0.38(0.02)*
ΔS_t	1.57(238.34)	9.12(4.46)+	1.32(1.17)	10.46(42.29)	0.39(5.27)	-9.19(12/94)	1.88(3.25)
Break Dummy			0.06(0.01)*				
CMC			-0.38(0.18)+				
ω			0.34(0.20)@				
ρ			0.97(0.01)*				
δ			-0.14(0.05)*				
α			0.22(0.06)*				
β			0.43(0.15)*				
PR^2	0.14	0.14	0.01	0.04	0.03	0.02	0.001
T	559	559	933	556	556	538	538
AIC			1.28				

Notes: Quantile regression at the 0.01 and .1 quantiles (large negative return) with bootstrap (mcm method; 1000 replciations) standard errors; Epanechnikov kernel; and Hall-Sheather bandwidth method (also see notes to Table 2; CGARCH(1,1) is estimated via Maximum likelihood. Break dummies are the ones estimated in Table 2; CMC is a dummy equal to 1 during the Cuba Missile Crisis (Oct. 16-28, 1962); and AIC is the Akaike Information Criterion.

Table 4: Tail Behavior of Individual Stock Returns: Selected Results

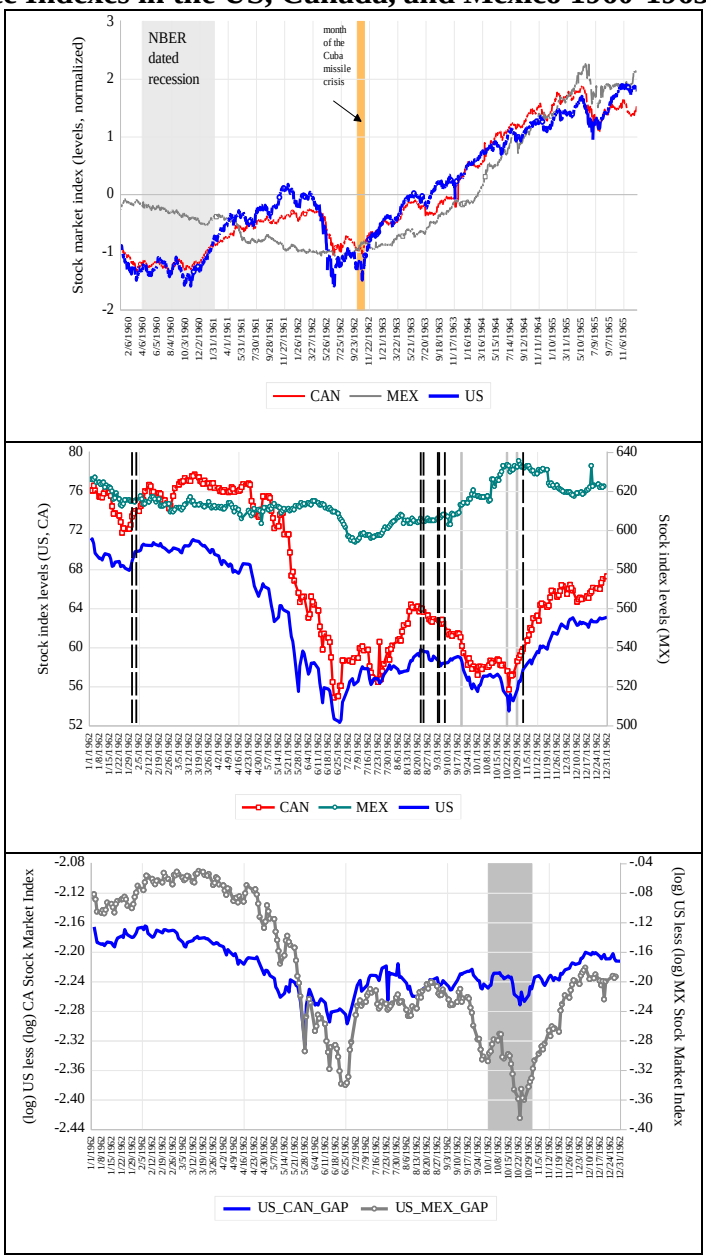
Stock	τ	θ_4	SET	SQT	PR^2	Stock	τ	θ_4	SET	SQT	PR^2
Amer Motors	.01	-.01	.70	.00	.40	Lockheed	.01	.01	.04	.77	.08
	.01	-.02	.00	.00	.05		.01	-.01	.16	.00	.02
	.10	.01	.71	.00	.08		.10	-.03@	.02	.75	.01
	.10	-0.03@	.00	.00	.02		.10	-.01@	.16	.00	.01
Atlantic	.01	.02@	.00	.01	.03	Martin	.01	-.005	.00	.00	.11
	.01	-.01	.00	.02	.02		.01	-.02	.00	.01	.01
	.10	.06*	.00	.01	.02		.10	.01	.00	.00	.01
	.10	.01	.00	.04	.001		.10	-.02	.00	.00	.003
Barber	.01	.002	.002	.00	.17	NA Sugar	.01	.02	.02	.09	.31
	.01	-.01+	-.01+	.00	.04		.01	-.09+	.00	.01	.06
	.10	.04*	.04*	.00	.05		.10	.02	.02	.08	.10
	.10	-.002	-.002	.00	.01		.10	-.08@	.00	.00	.03
Bethlehem	.01	-.04	-.04	.19	.226	NCR	.01	-.04	.64	.24	.11
	.01	-.07+	-.07+	.00	.14		.01	-.04*	.00	.00	.01
	.10	-.03	-.03	.15	.03		.10	-.01	.65	.23	.04
	.10	-.06+	-.06+	.00	.06		.10	-.03*	.00	.00	.01
Boeing	.01	.01+	.00	.40	.07	Pharmacia	.01	-.01	.53	.00	.09
	.01	-.01@	.57	.00	.02		.01	-.02+	.00	.03	.05
	.10	-.01	.00	.38	.04		.10	.01	.48	.01	.02
	.10	-.01*	.53	.00	.01		.10	-.02@	.00	.03	.02
Chevron	.01	-.001	.00	.15	.25	Pitney	.01	.001	.09	.65	.16
	.01	-.02*	.20	.00	.04		.01	-.04+	.00	.00	.15
	.10	-.04+	.01	.11	.05		.10	-.003	.07	.67	.01
	.10	-.01+	.24	.00	.01		.10	-.004	.00	.00	.02
Chrysler	.01	-.003	.05	.15	.08	Polaroid	.01	.02	.13	.20	.34
	.01	-.02*	.00	.00	.03		.01	.002	.00	.00	.22
	.10	-.01	.05	.22	.002		.10	-.003	.12	.17	.13
	.10	-.02+	.00	.00	.01		.10	-.03*	.00	.00	.06

Continental	.01 .01 .10 .10	.02+ -.01 .04* .01	.00 .00 .00 .00	.06 .00 .08 .00	.17 .03 .04 .01	Royal Dutch	.01 .01 .10 .10	-.02 -.04+ -.03 -.05+	- ..28 .00 .26 .00	.59 .01 .60 .02	.28 .11 .07 .02
Curtis	.01 .01 .10 .10	-.002 -.02+ -.02 -.01*	.02 .56 .02 .00	.00 .00 .00 .00	.05 .01 .02 .01	Ryerson	.01 .01 .10 .10	.001 -.01 .03* -.01	.00 .00 .00 .00	.97 .00 .98 .00	.12 .04 .02 .02
Douglas	.01 .01 .10 .10	-.01 -.02 .02@ -.01	.02 .00 .01 .00	.01 .04 .01 .04	.24 .03 .04 .03	Santa Fe	.01 .01 .10 .10	-.01 -.02* .03 -.01	.01 .00 .02 .00	.32 .01 .23 .01	.13 .08 .02 .01
ESB	.01 .01 .10 .10	.01@ .002 .03* .01	.01 .00 .01 .00	.00 .00 .00 .00	.10 .01 .01 .01	Seabord	.01 .01 .10 .10	.03 -.01 .04* -.01	.02 .00 .87 .00	.71 .25 .70 .30	.17 .03 .01 .004
Exxon Mobil	.01 .01 .10 .10	-.003 -.02* -.04@ -.00	.03 .17 .03 .18	.44 .05 .48 .09	.27 .05 .08 .01	Spartans	.01 .01 .10 .10	-.01 -.03* .01 -.04*	.87 .00 .83 .00	.26 .06 .25 .05	.25 .12 .14 .04
Ford	.01 .01 .10 .10	-.02 -.03+ -.12* -.03*	.42 .00 .46 .00	.50 .00 .45 .00	.18 .18 .04 .05	U. Carbide	.01 .01 .10 .10	.008+ -.003 .03 .003	.00 .00 .00 .00	.73 .00 .70 .00	.04 .06 .02 .04
GE	.01 .01 .10 .10	.00 0.01 -.03* -.02*	.20 .24 .24 .26	.00 .01 .00 .00	.15 .07 .03 .04	Unisys	.01 .01 .10 .10	-.09+ -.10* -.04+ -.03+	.48 .00 .42 .00	.74 .00 .60 .00	.34 .26 .08 .06
Gen Amer	.01 .01 .10 .10	-.07@ -.09+ -.05 -.07+	.43 .00 .42 .01	.01 .00 .01 .00	.25 .03 .04 .01	U. Pacific	.01 .01 .10 .10	.005 -.01@ .02* -.005	.00 .00 .00 .00	.13 .00 .17 .00	.11 .06 .01 .01

Globe	.01 .01 .10 .10	-.01 -.02+ .02+ -.01	.00 .00 .00 .00	.03 .00 .06 .00	.24 .05 .04 .003	US Steel	.01 .01 .10 .10	-.02 -.03+ -.03 -.01*	.55 .04 .57 .05	.07 .01 .05 .03	.23 .08 .06 .03
GM	.01 .01 .10 .10	-.01 -.02* -.13* -.03*	.12 .00 .11 .00	.11 .01 .10 .01	.18 .26 .09 .09	Westinghouse	.01 .01 .10 .10	-.00 -.01 .03* -.003	.06 .00 .04 .00	.34 .00 .42 .00	.11 .01 .003 .004
Granite	.01 .01 .10 .10	.001 -.02+ .03* -.01+	.00 .00 .00 .00	.17 .00 .17 .00	.03 .05 .01 .02	Xerox	.01 .01 .10 .10	-.02 -.01 -.00 -.02*	.00 .00 .00 .00	.13 .08 .11 .06	.18 .16 .08 .03
Kodak	.01 .01 .10 .10	.01 -.01@ -.04 -.02*	.01 .00 -.04 -.02*	.97 .00 .98 .00	.15 .36 .03 .12	Zenith	.01 .01 .10 .10	-.03 -.04 .04+ -.05+	.78 .00 .81 .00	.02 .00 .02 .00	.31 .08 .08 .03

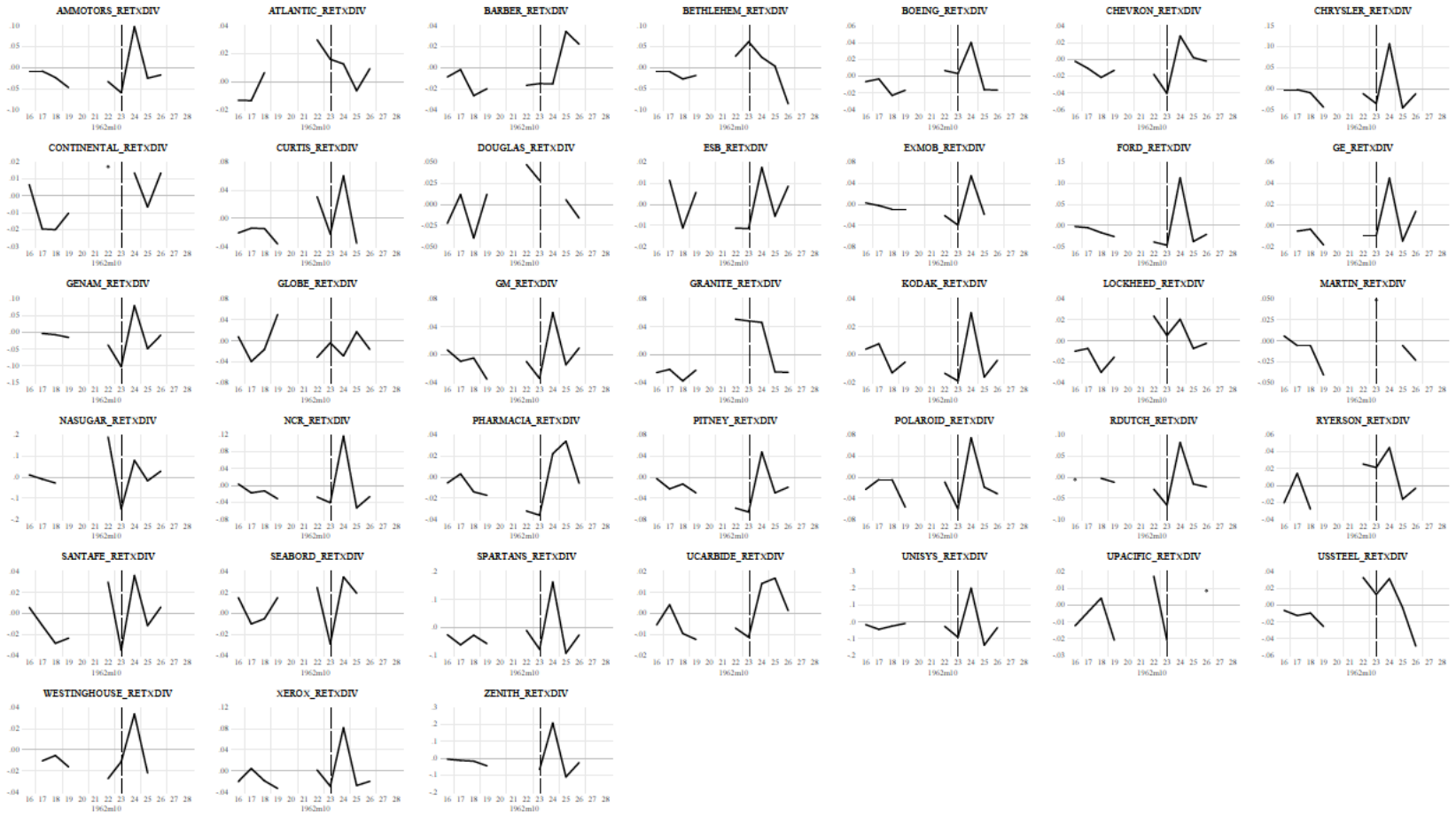
Note: τ refers to the quantiles estimated. θ_4 is the coefficient on the dummy variable for the Great Depression (Oct. 23-Nov. 14, 1929), Cuban Missile Crisis (Oct. 16-28, 1962), and the Global Financial Crisis (Aug. 4-Oct. 9. 2008). Significance levels are as in Table 2. SET is the p-value for the Wald test of slope equality (i.e., whether τ =.01 is statistically different from τ =.10). SQT is the Wald test for whether coefficient estimates for τ=.01, .10, .90, .99 are symmetric. The appendix contains more details about the individual stocks.

Figure 1: Stock Price Indexes in the US, Canada, and Mexico 1960-1965



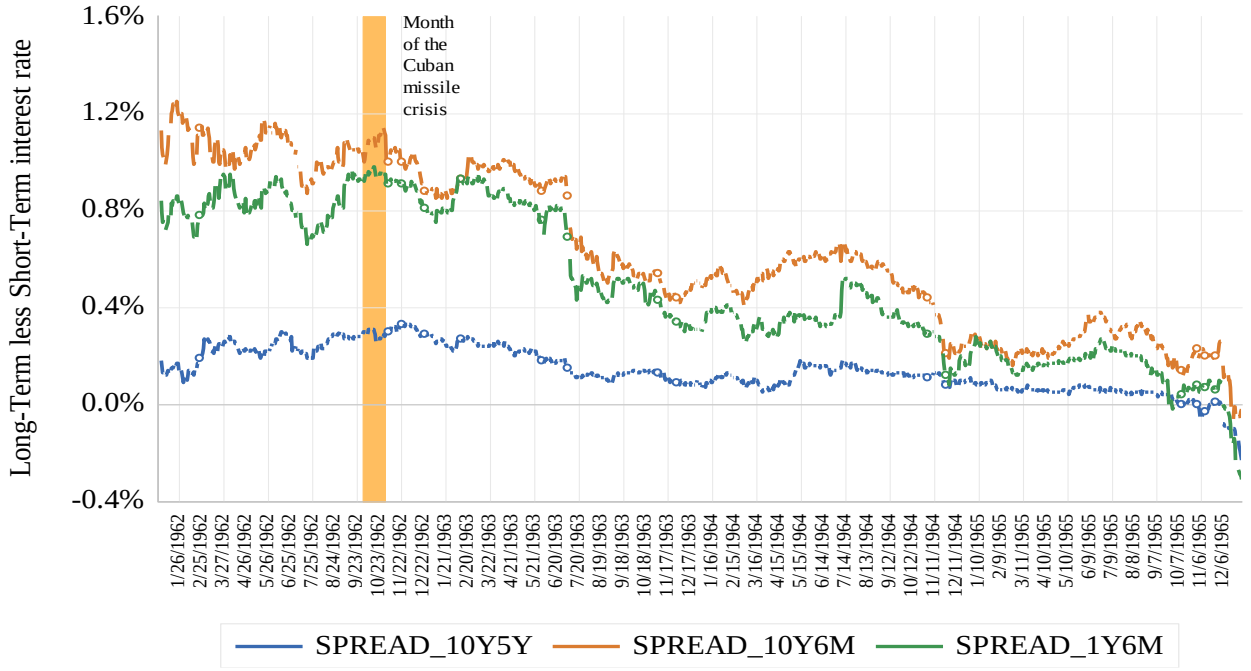
Note: Vertical dashed lines (middle Figure) indicate events highlighted in the chronology of events. See the Appendix. The shaded area (bottom Figure) highlights the October 1962 (entire month not the '13 days') crisis period. Data sources are given in the text.

Figure 2: Return Performance in a Selection of Stocks on the NYSE During the Thirteen Days



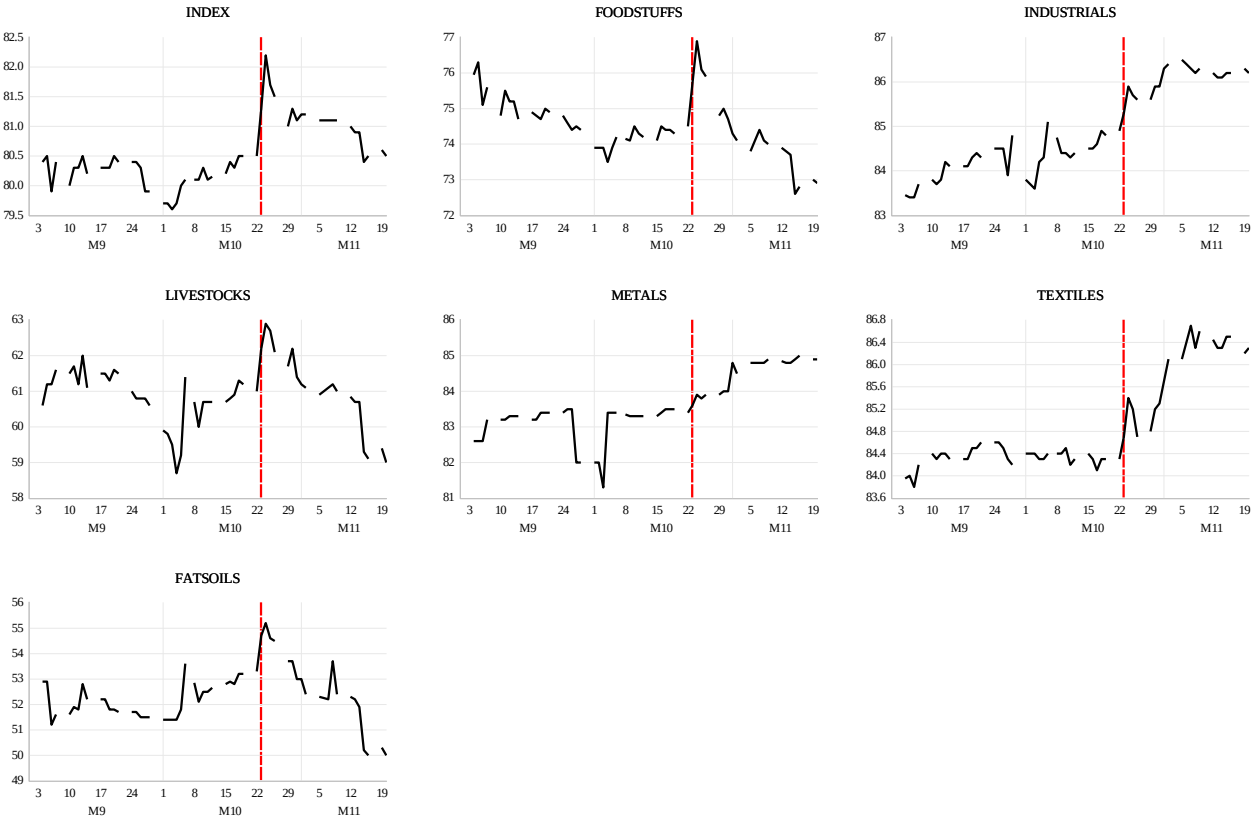
Note: See the appendix for more details about the stocks sampled. RETXDIV means return excluding dividends. The vertical dashed line is the day of President Kennedy's address to the nation (October 22nd, 1962). Gaps refer to non-trading days or where no price data are recorded. Data are from CRSP (Center for Research in Security Prices).

Figure 3: The Behavior of US Interest Rate Spreads 1962-1965



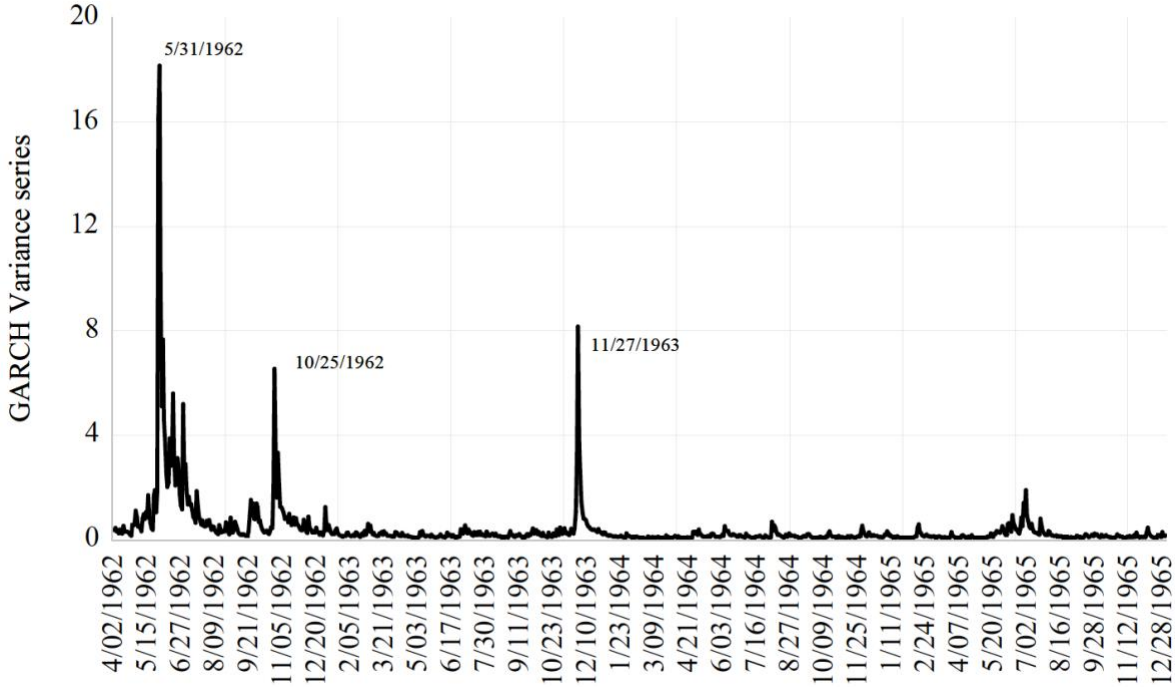
Note: 10Y5Y, 10Y6M, and 1Y6M, respectively, refer to the spread between US 10-year Treasury notes (10Y) vs. 5-year notes (5Y), one year T-bills (1Y), and six month T-bills (6M). Data from CRSP and FRED (Federal Reserve Bank of St. Louis).

Figure 4: Commodity Price Behavior Around the Time of the Cuban Missile Crisis



Note: Data as reported in daily issues of the *New York Times*.

Figure 5: Volatility in US Stock Returns



Note: Daily GARCH volatility series from the CGARH(1,1) estimates in Table 3.

APPENDIX

Selective Chronology of 1962 Crisis Events

31 January 1962	OAS excludes Cuba
February 3 1962	Cuba trade embargo announced
August 22 1962	CIA warns that Soviet Union may try to introduce missiles into Cuba
August 24 1962	State department press briefing on military build-up in Cuba
September 3 1962	Soviet – Cuba arms agreement announced
September 4 1962	JFK publicly announces "whatever means necessary" to counter Soviet 'aggression'
September 8 1962	1st ICBMs reach Cuba
19-20 September 1962	HR approves resolution of use of force against Cuba
September 21 1962	USSR warns of potential for war
October 2-3 1962	OAS meeting (in camera) and subsequent communiqué outlines grave concerns
October 8 1962	US withholds economic aid from countries trading with Cuba
October 16 1962	First presentations of U2 spy plane evidence made in the White House Cabinet Room
October 18 1962	Kennedy meets with foreign minister Gromyko
October 21 1962	Cuba 'blockade' leaks in NYT
October 22 1962	Kennedy speaks to the nation and the world US forces placed on DEFCON3 Diefenbaker in Canada declines to follow suit Crisis becomes public
October 23 1962	Announcement of interdiction of the delivery of offensive weapons to Cuba US media criticizes Canada (but Canada's foreign affairs minister Harkness discretely places military on alert)
October 25 1962	Diefenbaker states support for US
October 28 1962	US suspends Cuba blockade
October 29 1962	UN to appoint inspectors
October 29 – November 4 1962	Soviet forces withdraw from Cuba
November 2 1962	Kennedy makes statement about lack of progress in removing offensive weapons from Cuba
November 6 1962	Canadian forces return to normal operations

Source: See references provided in the text

Table A1: Largest Drops in Daily Stock Returns: United States, Canada, and Mexico 1962-1965

United States

5/28/1962	-6.68
6/04/1962	-3.55
11/22/1963	-2.81
10/23/1962	**-2.67**
6/12/1962	-2.56
9/19/1960	-2.271
6/21/1962	-2.17
6/14/1962	-2.11
4/24/1961	-2.08
5/23/1962	-1.97
5/22/1962	-1.97
5/25/1962	-1.90
9/24/1962	-1.84
7/17/1962	-1.82
6/28/1965	-1.76
6/22/1962	-1.70
4/30/1962	-1.60
9/26/1960	-1.56

Canada

3/30/1964	-4.08
7/25/1962	-3.53
7/18/1963	-2.42
6/21/1962	-2.37
6/28/1965	-2.24
5/23/1962	-2.02
11/22/1963	-1.99
9/22/1960	-1.93
6/04/1962	-1.90
5/18/1962	-1.82
6/14/1965	-1.80
10/23/1962	**-1.780532**
7/17/1962	-1.56
5/22/1962	-1.54
6/22/1962	-1.52
6/08/1965	-1.527
6/12/1962	-1.47
11/24/1964	-1.45

Mexico

8/03/1965	-3.56
7/13/1965	-3.36
4/30/1965	-3.23
12/20/1962	-2.80
10/11/1962	*-2.72*
6/11/1965	-2.59
8/10/1965	-2.38
8/07/1965	-2.28
4/06/1960	-1.96
8/06/1963	-1.95
6/30/1965	-1.92
4/26/1963	-1.79
3/24/1964	-1.68
8/17/1964	-1.65

5/03/1962	-1.62
4/08/1964	-1.50
9/13/1962	-1.49
3/20/1963	-1.47

Note: Daily stock returns are 100 times log first difference in stock market index levels. In bold (italics for Mexico) the daily return (ex dividends) the day following President Kennedy address to the nation.

Table A2: List of Stocks Sampled from the NYSE

NAME	SECTOR	Available Sample	T	Largest Drop (Full)	Largest Drop (CMC)	Largest Drop (GD)	Largest Drop (GFC)
American Motors	Automotive	1925/12/31-1987/08/05	12292	0.25	0.05	0.25	
Atlantic	Transport	1925/12/31-1981/06/03	10220	0.33	0.01	0.04	
Barber	Petroleum	1925/12/31-1967/12/30	13108	0.24	0.03	0.17	
Bethlehem	Steel (industrial)	1925/12/31-2002/06/11	18120	0.82	0.09	0.11	
Boeing	Aircraft	1934/09/05-2018/12/31	20257	0.21	0.02		0.08
Chevron	Petroleum	1925/12/31-2018/12/31	22416	0.17	0.04	0.06	0.12
Chrysler	Automotive	1925/12/31-1998/11/12	17684	0.18	0.05	0.16	
Continental	Steel (industrial)	1936/04/07-1973/05/11	8265	0.26	0.02		
Curtis-Wright	Defense (industrial)	1929/08/22-2018/12/31	18782	0.44	0.04	0.27	0.09
Douglas	Aircraft	1931/06/25-1967/08/08	8948	0.27	0.04		
ESB	Energy	1925/12/31-1974/09/03	11224	0.29	0.01	0.29	
Exxon-Mobil	Petroleum	1925/12/31-2019/12/31	22510	0.23	0.04	0.11	
Ford	Automotive	1956/03/07-2018/12/31	14572	0.25	0.05		
General Electric (GE)	Manufacturer (industrial)	1925/12/31-2018/12/31	22800	0.20	0.02	0.16	
General American	Petroleum	1957/04/24-1983/03/08	5760	0.14	0.10		
Globe Union	Industrial	1962/07/02-1978/10/10	3377	0.18	0.04		

General Motors (GM)	Automotive	1925/12/31-2009/06/01	20501	0.33	0.03	0.16	0.31
Granite	Construction (industrial)	1929/06/01-1971/08/13	9461	0.30	0.04	0.14	
(Eastman) Kodak	Manufacturer (industrial)	1925/12/31-2012/01/18	21112	0.54	0.02	0.19	
Lockheed	Aircraft	1939/12/09-2018/12/31	18552	0.25	0.03		
Martin Marietta	Building (industrial)	1937/04/26-1995/03/05	12969	0.21	0.04	0.13	
North American (NA) Sugar	Sugar	1925/12/31-1971/04/28	9516	0.33	0.15		
NCR	Manufacturer (industrial)	1934/04/26-1991/09/19	13577	0.15	0.05		
Pharmacia	Chemicals	1929/10/10-2003/04/15	17606	0.27	0.04	0.15	
Pitney-Bowes	Manufacturer (industrial)	1950/09/18-2018/12/31	15600	0.28	0.07		0.07
Polaroid	Manufacturer (industrial)	1957/11/04-2001/10/09	10364	0.35	0.06		
Royal Dutch	Petroleum	1954/07/20-2005/11/18	11830	0.22	0.07		
Ryerson	Holding Co.	1925/12/31-2007/10/18	18942	0.31	0..03	0.11	
Santa Fe	Transport	1925/12/31-1969/05/09	10797	0.14	0.03	0.11	
Seabord	Transport	1945/10/31-1980/10/31	7829	0.30	0.03		
Spartans	Industrial	1957/02/18-1971/02/26	3086	0.17	0.09		
Union Carbide	Chemicals	1926/03/01-2001/02/06	18110	0.19	0.01	0.19	
Unisys	Information Technology	1925/12/31-2018/12/31	21332	0.38	0.14	0.35	0.15
Union Pacific	Transport	1925/12/31-1971/06/25	11117	0.10	0.02	0.08	
US Steel	Steel (industrial)	1925/12/31-2018/12/31	22601	0.37	0.05	0.09	0.11

Westinghouse	Manufacturer (industrial)	1925/12/31-1968/06/07	9953	0.16	0.03	0.15	
Xerox	Manufacturer (industrial)	1961/07/11-2018/12/31	13876	0.26	0.03		0.08
Zenith	Television (industrial)	1929/07/18-1998/05/21	15666	0.69	0.11	0.34	

Source: CRSP. Dates are expressed as yyyy/mm/dd. Since only declines are considered all values in the last 4 columns are negative. CMC is the Cuban Missile Crisis (Oct. 16-28, 1962); GD is the Great Depression (Oct. 23-Nov. 14, 1929); and the Global Financial Crisis (Aug. 4-Oct. 9, 2008). T is the total number of available observations. A blank means no data are available. The data refer to returns excluding dividends on a daily basis.

Table A3: Top 10% of Declines in Daily Stock Returns (ex dividends): 1962-1965

NAME	% of T
American Motors	3.2
Atlantic	2.3
Barber	1.9
Bethlehem	2.5
Boeing	6.0
Chevron	3.6
Chrysler	7.0
Continental	4.0
Curtis-Wright	4.3
Douglas	9.3
ESB	4.2
Exxon-Mobil	4.4
Ford	4.7
General Electric (GE)	6.1
General American	6.8
Globe Union	7.5
General Motors (GM)	3.7
Granite	3.9
(Eastman) Kodak	4.2
Lockheed	5.9
Martin Marietta	7.1
North American (NA) Sugar	3.8
NCR	6.8
Pharmacia	5.1
Pitney-Bowes	11.3
Polaroid	8.1
Royal Dutch	6.1

Ryerson	5.6
Santa Fe	4.0
Seabord	7.1
Spartans	8.5
Union Carbide	3.5
Unisys	7.0
Union Pacific	5.4
US Steel	4.7
Westinghouse	4.6
Xerox	11.2
Zenith	2.9

Note: The table shows, as a percent of all observations for the Jan. 4,1962/- Dec. 31, 1965 sample, the fraction of the 10% largest drops in daily stock returns (ex dividends).

Table A4 Skewness of Stock Returns

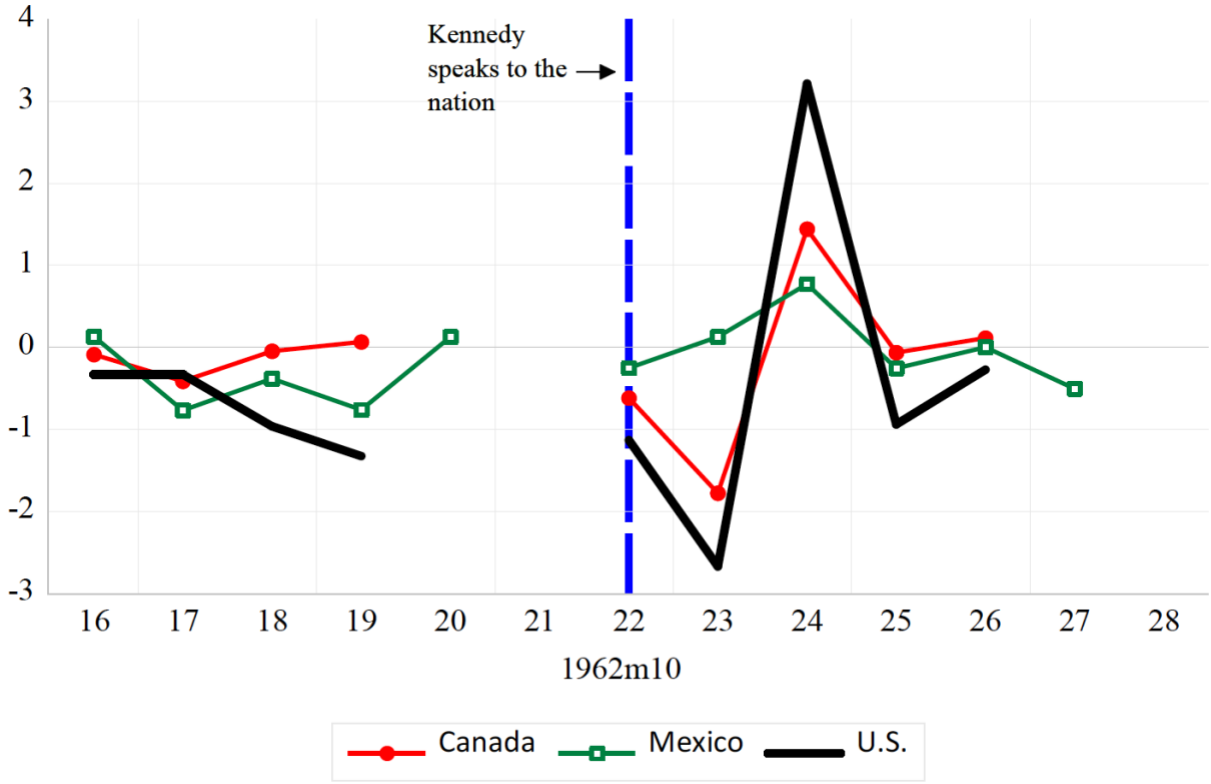
Market	Sample: 1/4/1962-12/31/1962	Sample: 1/4/1962-12/31/1965
USA	-0.629	-0.746
CANADA	-0.006	2.098
MEXICO	-0.358	0.663

Table A5: The Doomsday Clock

Year	Minutes Before Midnight
1947	7
1949	3
1953	2
1960	7
1963	**12**
1968	7
1969	10
1972	12
1974	9
1980	7
1981	4
1984	3
1988	6
1990	10
1991	17
1995	14
1998	9
2002	7
2007	5
2010	6
2012	5
2015	3
2016	3
2017	2.5
2018	2
2019	2
2020	1.4

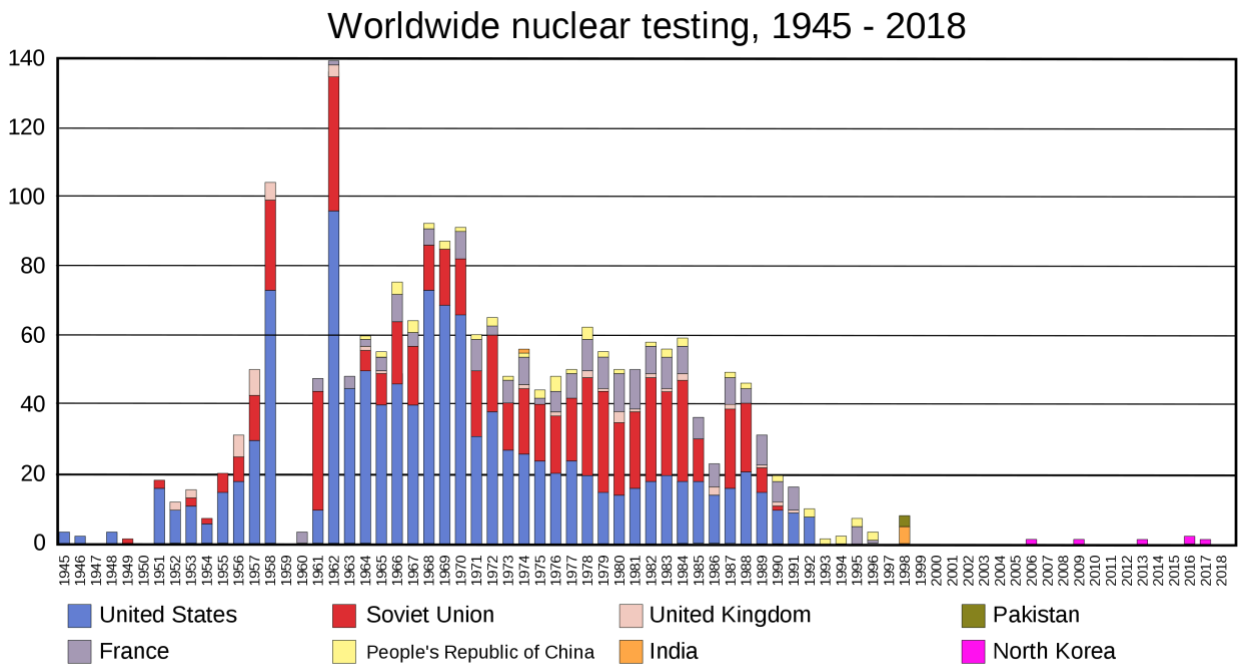
Source: Bulletin of the Atomic Scientists “Doomsday Clock” [https://thebulletin.org/doomsday-clock/current-time/#clock-timeline]

Figure A1: Aggregate Returns Around the Time of President Kennedy's Address to the Nation



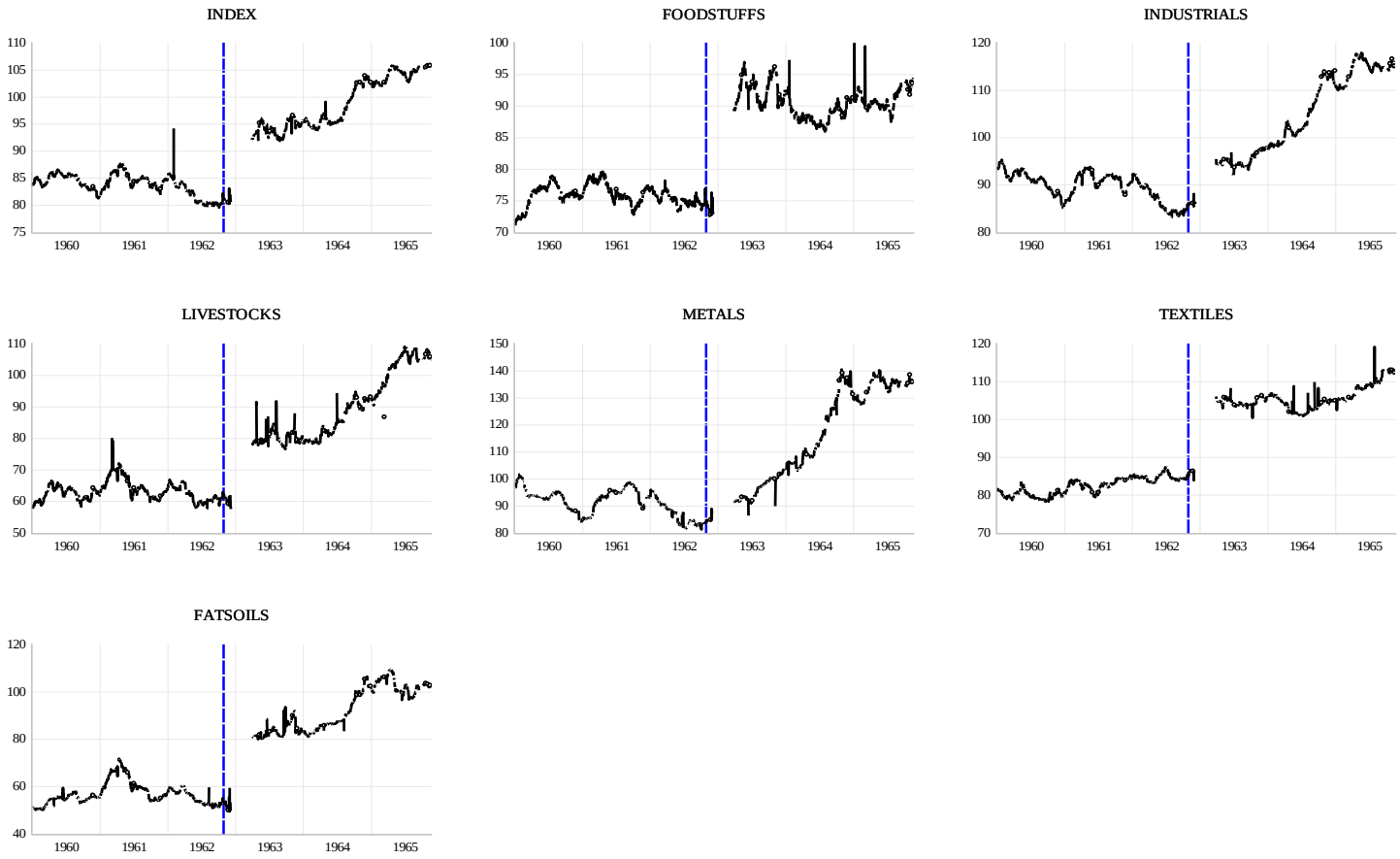
Source: Data source listed in the main text. Returns are ex dividends. The vertical axis is in percent. No trading on the weekend of October 20-21, 1962.

Figure A2: World Wide Nuclear Testing: 1945-2018



Source: By Worldwide nuclear testing.svg: Source: Oklahoma Geological Survey Nuclear Explosion Catalog - This file was derived from: Worldwide nuclear testing.svg, CC BY-SA 2.5, https://commons.wikimedia.org/w/index.php?curid=65809060.

Figure A3: Commodity Prices, 1960-1965



Note: Gap is due to lack of data. The vertical dashed line marks the day following President Kennedy's evening speech to the nation and the world. See the main text for data sources and details.