Asset Values and the Sustainability of Peace Prospects

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Abstract

Continuous violent conflict is a central cause of economic stagnation in many of the world's poorest countries. Given that attempts to achieve peace in these countries often remain elusive, it is important to identify mechanisms which reveal the sustainability of peace over time. We argue that long-term financial asset values reflect the sustainability of peace prospects because the expectation of continued peace will result in higher long-term asset prices. Equity index prices from Sri Lanka are used to test this theory. Also considered are the accuracy of equity prices versus other predictors of sustainable peace, including exchange rates and survey responses. The main conclusion is that long-term financial asset prices indicate the likelihood of conflict or peace and can inform policies as they relate to conflict-torn areas.

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Abbreviations:
ASPI: All Share Price Index
CFA: Ceasefire Agreement
CSE: Colombo Stock Exchange
GARCH: Generalized Autoregressive Conditional Heteroskedasticity
ISGA: Interim Self-Governing Authority
JHU: National Heritage Party
JVP: People's Liberation Front
LTTE: Liberation Tigers of Tamil Eelam
MPI: Milanka Price Index
PCI: Peace Confidence Index
SLFP: Sri Lanka Freedom Party
TULF: Tamil United Liberation Front
UNP: United National Party

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1. Introduction

Internal violence is a central cause of continued economic stagnation in many of the world's poorest countries. As Collier (2007: 18) notes, many of these countries "are stuck in a pattern of violent internal challenges to government," which "…can trap a country in poverty." Understanding the causes of this conflict trap and potential solutions is a central policy issue. In many cases attempts to achieve sustained peace have remained elusive. Consider, for instance, the attempts to negotiate peace in Rwanda, Sierra Leone, Sri Lanka, Somalia, and Angola in the 1990s. In each case the inability to get the relevant parties to commit to peace resulted in the onset and escalation of conflict. When peace is unsustainable, the costs are significant, as illustrated by the case of Rwanda where over 800,000 people died following the collapse of a negotiated peace agreement.

In cases of long-term conflict, obtaining initial peace is a necessary, but not sufficient, condition for breaking free of the conflict trap. Also important is ensuring that peace is sustainable, meaning that it will persist over time. Determining the sustainability of peace prospects is important for citizens who, as Rwanda illustrates, often incur the costs of conflict. Gauging the sustainability of peace is also important for an array of international actors (e.g., international organizations, governments, non-government organizations, etc.) because decisions have to be made regarding the type and level of resources (e.g., monetary and humanitarian aid, negotiators, troops and peacekeepers, etc.) invested in conflict-torn areas. Given this, a central issue is the identification of mechanisms which reveal the sustainability of peace.

It is our contention that long-term asset prices reflect the expectation of sustained peace or continued conflict. In the case of an ongoing conflict, asset prices may reflect different influences, including the prospects, or changes in the prospects, of one side or the other winning

the conflict outright, or the likelihood of parties involved in conflict delivering on commitments to peace.[1] Given this, our central thesis is that long-term financial asset prices accurately reflect the confidence of investors in the stability of institutions and can therefore be used as an indicator of the perceived sustainability of peace.

If peace is not sustainable, meaning that conflict will continue in the future, investors will change their expectations regarding institutional stability leading to a fall in long-term asset prices. Similarly, if peace prospects are viewed as sustainable, indicating continued peace and institutional stability, this will result in an increase in long-term asset prices. Since long-term financial asset prices can be used to predict the sustainability of peace, they can play an important role in informing policies toward conflict-torn areas.

Our contribution is twofold. First, we build on an existing literature which establishes asset prices as indicators of expectations. To date, this literature has mainly used financial asset prices to interpret and understand historical events. We extend this reasoning to ongoing conflicts and, in so doing, provide a specific, forward-looking mechanism that can be used to gauge the sustainability of peace over time. By establishing a link between economic variables and the sustainability of peace, we identify a tool that can be utilized to inform policy decisions. For example, this knowledge could allow governments and international agencies to reallocate resources (e.g., troops, humanitarian aid, etc.) if peace is expected to be unsustainable. Second, we provide insight into which indicator best predicts the sustainability of peace by analyzing and comparing long-term asset prices, exchange rates, and survey responses.

In order to test our general thesis regarding the effectiveness of long-term financial assets as indicators of the sustainability of peace, we analyze the long-running and, until recently,

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[1] We are grateful to an anonymous referee for brining this point to our attention.

seemingly intractable conflict in Sri Lanka.[2] Sri Lanka provides an interesting test case for our

hypothesis given that it has been characterized by ongoing conflict for several decades. Further,

the government and rebel parties have entered into numerous peace agreements only to have

them unravel in a relatively short period of time, meaning that peace was unsustainable. Given

this, Sri Lanka provides a natural experiment to test our general thesis. Our thesis indicates that

where peace prospects are not sustainable, long-term asset markets should respond with lower

values. Similarly, where peace is sustainable, long-term asset markets should respond with

higher values. In the case of Sri Lanka, we analyze asset values prior to the breakdown of peace

to see if this is indeed the case. Our analysis indicates that the asset price variable captures the

prospect that conflict would end soon and that the government would not lose.

Within the context of the Sri Lankan conflict we also consider the accuracy of long-term

financial assets versus alternative indicators such as exchange rates and survey data. We

conclude that long-term financial assets are better indicators of the sustainability of peace as

compared to other alternatives. Intuitively, this finding makes sense. Surveys can suffer from

issues of accuracy and objectivity and are often lagging indicators of the persistence of peace.

Short-term financial assets can suffer from sensitivity to short-term factors. Stock markets

overcome these problems and therefore provide the best indication of the sustainability of peace.

Our analysis proceeds as follows. The next section provides an overview of the literature

that establishes the use of economic variables as indicators of expectations. Section 3 discusses

the empirical strategy for testing our thesis. Section 4 consists of an overview of the Sri Lankan

conflict, as well as our empirical results. Section 5 provides an analysis of our results in the

historical context of conflict in Sri Lanka. The section also considers the effectiveness of long-

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[2] In May 2009, the Sri Lankan military defeated the main rebel group, the Liberation Tigers of Tamil Eelam
(LTTE).

term financial assets relative to other potential indicators of the sustainability of peace, such as short-term exchange rates and survey responses. Section 6 concludes with the implications of our analysis.

2. Asset Prices, Expectations, and Sustainability

The realization that expectations regarding future occurrences influence current economic outcomes has a long history, as is evident in the work of Beveridge (1909), Pigou (1920) and Keynes (1936). Following Muth (1961), who first used the term 'rational expectations,' the systematic study of expectations began with the 'rational expectations revolution' in the 1970s. Lucas (1972, 1976) operationalized the concept in macroeconomic models and Sargent and Wallace (1973, 1975) extended the logic of rational expectations to monetary policy demonstrating the limitations of government policy in this regard. In its simplest form, the concept of rational expectations holds that outcomes will not differ systematically from what individuals expect those outcomes to be. The concept has been applied to a wide variety of topics including the efficient markets theory of asset prices, the design and implications of government stabilization policies, the concept of tax smoothing, and the dynamics of inflation and hyperinflation.

To the extent asset prices capture the expectations of economic actors they can be used as predictors of changes in economic, political and social institutions. In their analysis of the Glorious Revolution, North and Weingast (1989) capture this sentiment when they note that, "since capital markets are especially sensitive to the security of property rights, they provide a unique and highly visible indicator of the economic and political revolution that took place" (819). What North and Weingast are emphasizing is that the capital markets reflect the

expectations of investors regarding the stability of institutions. This logic has been applied to the analysis of numerous historical events.

Wells and Wills (2000) provide an empirical test of North and Weingast (1989) to analyze the impact of political and economic events on financial markets. Specifically, they analyze the impact of institutional changes caused by the Glorious Revolution on English capital markets. The logic underlying their analysis is that assets will be re-priced depending on investor expectations about the future stability and security of institutions. Threats to institutional stability are reflected by downturns in capital markets while improvements in institutional quality will lead to upturns in capital markets. Wells and Wills conclude that capital markets accurately reflect the expected stability of institutions and note that, "the markets themselves, though caught here in their infancy, seem to have been remarkably capable of reacting in the appropriate direction when events threatened or supported their underlying values" (2000: 439-440). This is an important point, because it indicates that even relatively young capital markets reflect the expectations of citizens and investors.

McCandless (1996), building on the earlier work of Mitchell (1903), explores the hypothesis that expectations of future government behavior during the Civil War were a major factor in determining the price of gold. Specifically, he contends that news regarding the war was a key predictor of future government behavior. In order to test his hypothesis, McCandless compares the prices of gold in the North to the price of gold in the South. If expectations are rational, the price of gold in the two regions should move in opposite directions. This is because a war related event that was positive for the North (reflected in an increase of gold prices) was bad for the South (reflected in a decrease of gold prices) and vice versa. This expected outcome is precisely what McCandless finds. He concludes that "the demonstration that currency prices

do respond predictably to events other than actual money supply changes and the notion that the driving force behind these changes are expectations are important lessons for periods of peace as well as those of war" (1996: 668).

Finally, Sobel (1998) analyzes the effectiveness of United Nations interventions through their impact on exchange rates. The underlying logic is that international interventions that increase stability should result in an appreciation of a country's currency. Sobel uses this method of analysis to gauge the effectiveness of direct United Nations peacekeeping interventions in Lebanon and indirect interventions via economic sanctions in South Africa.

As these studies indicate, the expectations of investors regarding changes in institutions are reflected in asset prices. In the context of peace prospects, there are two important open issues. First, can asset values be utilized in a forward-looking manner to predict the sustainability of peace in future periods? To date, the use of financial asset prices has mainly been applied to interpret and understand historical events. Our main contribution is to extend the logic underlying these studies to the sustainability of peace in areas characterized by ongoing conflict. It is our contention that the analysis of asset markets provides insight into not only into past events, but also into anticipated future events. When peace is sustainable and institutional stability is expected, we should observe upturns in long-term asset markets. Likewise, the expectation that peace will not sustain will be reflected in downturns in long-term asset markets. This information can be used in determining policy toward conflict-torn areas.

Second, what is the best indicator of the sustainability of peace? As discussed, previous studies have employed a variety of indicators to capture expectations. An interesting question is whether some of these indicators better predict the persistence of peace over time. In our analysis of Sri Lanka, we provide an answer to this question by analyzing long-term asset prices,

exchange rates, and survey responses to see which best indicates the sustainability of peace.

3. Empirical Strategy: Testing Long-Term Asset Values as Indicators of the Sustainability of Peace

The ability to determine the sustainability of peace using asset values rests on two important points. First, it is assumed that rational agents understand the true intentions of the warring parties and act on this information, so that the market achieves a stable equilibrium. This may seem controversial, but in reality this could be achieved in a market where only a few knowledgeable speculators monitor this equilibrium. We view these agents as experts who are privy to the intentions of the government and other parties, and who use this information to avoid capital losses and pursue capital gains. Examples of such experts include participants in peace negotiations, high-level military and civil leaders, and international experts and specialists who have detailed knowledge of particular conflicts, countries, and geographic regions.

The second necessary element concerns the theoretical effects of pre-announced or anticipated changes in policy on variables such as the price level. In the case of unanticipated changes in fundamentals, we assume a discontinuity or 'jump' in the level of the variable at the time of the announcement. When the anticipated change in policy actually does take place, the variable will nonetheless remain at the same value it had immediately before the correctly anticipated change. This is based on the 'asset price continuity principle' (see Auernheimer and Lozada 1990) which emphasizes that no unexploited capital gains or losses can occur at the time of a fully anticipated or pre-announced change. Gains or losses only take place in response to new information that is unforeseen by agents, as they are unable to structure their portfolios, *ex ante*, to take advantage of such events. It is this unforeseen news that generates jumps in the

price level and/or asset values.

The empirical counterpart to a jump in the level of prices is a structural shift, or 'regime change.' A regime change is interpreted as an occasional, discrete shift in the parameters regulating the time series behavior of an economic variable. The empirical implementation of our approach is essentially one of determining the existence of regime changes within conflict-torn economies in response to, and in anticipation of, observable events.

There are several empirical methods that can be used to isolate one regime from another in a data set. A simple and flexible model that can be applied to determine regime shifts in a single time series is a rolling regression procedure like that used in Banerjee, Lumsdaine and Stock (1992) and Willard, Guinnane and Rosen (1996). The first step is a search for all possible break dates in a data sample. This involves estimating an autoregression on a small portion of the sample referred to as the 'window.' A potential break date, s, is determined by the mid-point in the window, and the size of the window is a function of the frequency of observations on the variable. For example, for monthly data, a window of two years (24 months) would identify regime changes that affected the behavior of the variable for twelve months or more.

The main concern of the procedure is with the sign and significance of the parameter, which indicates a possible break in the mean of the series at the midpoint of the window. A significant F-statistic associated with this parameter would suggest that a regime change may have occurred on date s. Once that statistic is derived for the first sub-sample, we can move the window one observation closer to the end of the sample and re-estimate the equation, again testing for a break. In this way, one rolls through the series and tests for possible breaks over the entire sample, except for the first and last 'half-window' of observations. The vector of F-statistics associated with possible break dates reveals information on the most likely dates of

regime change.

In the next section we employ this technique to empirically analyze the effectiveness of asset prices in indicating the sustainability of peace in Sri Lanka. We choose a two-year window, representing about 15% of the total number of observations, as our baseline.[3] However, in order to ensure that our results are relatively robust, we also run the rolling regression procedure using windows of one and three years. Thus, a permanent regime change will be detected as any movement sustained for a minimum of six months (for the one year window) to 1.5 years (for the three year window). We identify the largest F-statistics as the most likely dates of a change in regime. We then match these dates to recorded events from the Sri Lankan conflict to analyze how various incidents were viewed as affecting the likelihood of conflict and peace. We also test each of these dates for a break in the underlying volatility of the data-generating process, to account for the possibility that events may cause increases in the uncertainty surrounding asset values without necessarily affecting their means.

4. Sri Lanka: A Natural Experiment in Conflict and the Sustainability of Peace

4.1 A Brief History of Conflict in Sri Lanka

The island of Sri Lanka, with an estimated population of 2.9 million, is located off the southern tip of India (CIA World Factbook). Sri Lanka's population consists of three main ethnic groups—the Sinhalese (74%) the Tamils (18%) and the Muslims (7%). Conflicts in Sri Lanka are mainly between the Buddhist Sinhalese majority and the Hindu Tamils (Malhotra and

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[3] See Banerjee et al. (1992) for a discussion regarding the choice of window lengths.

Liyanage 2005: 914). In order to understand why peace remained elusive for such a long period of time, it is important to consider the history of the conflict.

The Sinhalese arrived in what is now Sri Lanka in the 6th century B.C. India seized the northern part of Sri Lanka in the 14th century and established a Tamil government. After occupation by the Portuguese in the 16th century and the Dutch in the 17th century, the island became a British Crown colony in 1798 following a short struggle with the previous Dutch rulers. The roots of conflict can be found in the British colonial practices. Tea and rubber estates were developed, and Tamil laborers were imported from India to work the plantations when the Sinhalese residents refused to work for the low wages offered by the British (Kearney 1985). However, as the colonial occupation continued, the Sinhalese were passed over for education and employment opportunities that instead went to the Tamils. The result of British rule was the domination of the island's economic and political life by the Tamil minority (Center for Strategic & International Studies 2004).

In 1948, Sri Lanka gained independence and a Sinhalese government was appointed to rule the new country. The government passed discriminatory legislation against Tamils, allowing the Sinhalese greater access to land, education, and employment. Some plantation Tamils were even deported to India. Legalized discrimination continued through the 1970s, when two major Tamil parties joined to form the Tamil United Front, which would later become the Tamil United Liberation Front (TULF). TULF chose to work within the system and pressed for the creation of a separate state called Tamil Eelam (Kearney 1985). Other Tamils, more militant than those of the TULF, chose the path of armed conflict and formed the Liberation Tigers of Tamil Eelam (LTTE). The most extreme Tamil groups concentrated their efforts on murdering Sinhalese officials and civilians (Center for Strategic & International Studies 2004).

Major conflict between the LTTE and the Sinhalese-led government began in 1983 and ended in 2009. The costs of the conflict have been high as it is estimated that over 65,000 people were killed, while approximately 10 million people were displaced (Malhotra and Liyanage 2005: 914).[4]

There were periods of peace in Sri Lanka—1987-1988, 1991, 1994-1995, and 2002-2006—since the beginning of the conflict between the government and LTTE. However, until 2009, in each case the peace was proven to be unsustainable. Given the historical experiences and interactions between the Sinhalese and the Tamils, there was great mistrust between the two sides. This lack of trust made sustained peace elusive.

To provide one illustration of how mistrust manifested itself in the context of the Sri Lanka conflict, consider the following example. In October 1994, negotiations between the government and the LTTE were initiated. However, in April 1995 the LTTE violated the cease fire resulting in violent clashes. Part of the explanation for the failure of the agreement is that the government failed to recognize the LTTE as an equal partner in the broader negotiation process. The negotiation team chosen by the Sri Lankan government consisted of low-level negotiators who had little power to compromise. This signaled to the LTTE that the government was not serious about reaching an agreement and that any rhetoric regarding long-term peace was not to be trusted (Balasingham 2000: 145 and Höglund and Svensson 2006: 375). Further, during the peace talks, members of the Sinhalese-led government publicly stated that, "peace talks would help to separate the Tamil people from the LTTE" (quoted in Perera 1998: 244). This led the members of the LTTE to believe that they would have little to no power in a post-conflict Sri Lanka. As such, they had little incentive to negotiate toward, and commit to sustainable peace.

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[4] For a more detailed analysis of the Sri Lanka conflict, see Little (1994), de Silva (1998), and Wilson (2001).

The problem of mistrust illustrated by this example can be generalized to all efforts to obtain sustainable peace among warring parties. It is critical for those seeking to assist conflict-torn areas to recognize the importance of expectations regarding the sustainability of peace. When a legitimate commitment to sustainable peace is absent, the likelihood of continued conflict is greater. If this increased likelihood is known, it can be used as in input into policy decisions regarding intervention and the allocation of resources. The central issue becomes finding a means of gauging the sustainability of peace prospects. Our thesis is that that long-term asset prices are one indicator of expectations regarding the sustainability of peace.

4.2 Testing the Theory: An Empirical Analysis of Long-Term Financial Asset Values in Sri Lanka

We employ the technique discussed in Section 3 to test for structural change in long-term financial assets in Sri Lanka. Our data consists of monthly closing index prices of Sri Lanka's only national stock market—the Colombo Stock Exchange (CSE)—from July 1997 to May 2008. The CSE keeps two main price indices, the All Share Price Index (ASPI) and the Milanka Price Index (MPI). Our analysis uses the ASPI data because it includes all companies listed on the exchange.[5] The ASPI serves as a marker of financial asset prices over the period of analysis. The data is plotted in Figure 1:

INSERT FIGURE 1 ABOUT HERE

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[5] The All Share Price Index (ASPI) is based on the share movements of all companies on the stock market. Calculations for the ASPI use 1985 as a base year. The ASPI equals the market capitalization times 100 divided by the base market capitalization, where market capitalization equals the number of shares issued times the market

An examination of the data suggests a few potential windows where structural change may have occurred: (1) late 2001-early 2002, where an upward trend becomes evident; (2) late 2004-early 2005, where the trend seems to accelerate; and, finally, (3) late 2005-early 2007, where the series falls sharply, surges, falls again, and then finally 'flattens' out for the duration of the sample.

Rather than assume breaks exist *a priori*, however, we run the tests discussed in Section 3 for structural change in order to identify the exact locations and magnitudes of possible regime shifts, and to verify that they indeed qualify as significant changes in regime according to our pre-determined window length. Because Augmented Dickey-Fuller (ADF) tests suggest that the index series is non-stationary, we run all of our estimation procedures on the differenced index series rather than on its levels.[6]

Another aspect of the data that is noticeable on initial examination is the presence of heteroskedasticity. The data appear relatively stable up until about mid-2003, after which an increase in volatility becomes apparent. Ordinary time series techniques that assume a constant variance will be unreliable under such conditions, necessitating the use of modeling techniques that correct for time-variant volatility. Some of the most suitable techniques for this task are Generalized Autoregressive Conditional Heteroskedasticity (GARCH) models. We employ such models in our study upon verifying that volatility in the Sri Lankan market index is, indeed, time-variant. Evidence of this time-variant volatility is presented in Figure 2, which is a graph of the stationary, differenced index series:

INSERT FIGURE 2 ABOUT HERE

price, and base market capitalization is the number of issued shares at the base year times the base year market price.
[6] Since ADF tests for non-stationarity are now standard in the literature, we do not outline the procedure or results here. Details of such procedures can be found in Enders (1995). It is not uncommon for stock prices and indexes to exhibit non-stationary behavior.

Our rolling regression technique on the baseline window yields a number of possible break points in the series mean, illustrated in Figure 3 below:

INSERT FIGURE 3 ABOUT HERE

Among the series of F-values produced, there are 'spikes' at observations 52, 89, and 101.[7] These observations correspond to the following months: October 2001, November 2004, and November 2005. Further verification of the importance of these break dates is obtained by testing individually and jointly for statistical significance of regime shifts in both the intercept and slope of the differenced stock index series. Individual and joint tests of significance are run within the context of a GARCH model in order to account for the time-variant volatility that the series exhibits. The results are presented in Table 1, with the individual hypothesis test results in the first row and the joint (multivariate) results in the second row:

INSERT TABLE 1 ABOUT HERE

As indicated in Table 1, all three potential break dates pass tests for significance in the individual equations at either the 5% or 10% alpha level. More importantly, for all three break dates, either the intercept or trend exhibits evidence of a statistically significant regime shift (at the 5% level) when tested jointly with the other observations. All three are, therefore, likely dates of regime change in the stock index series. It is notable, also, that all three dates pass our tests of statistical

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[7] Regressions using the three-year windows produced a similar series, while the one-year subsamples produced a rather "noisy" (and thus less useful) set of F-values. Since two of the three window lengths produced similar results,

significance for change in the variance.[8]   Results of these tests for breaks in volatility are summarized in Table 2:

INSERT TABLE 2 ABOUT HERE

In sum, our empirical method has produced evidence of at least three breaks with respect to the mean, trend, and/or variability of the differenced series. Shifts in mean can be interpreted as regime changes that affected the time path (i.e. slope) of the Sri Lankan monthly stock index series; shifts in trend is a modification of the rate of change in that slope; and shifts in variance are regime changes that have affected the level of (un)certainty surrounding those time paths.

The next section provides an analysis of these breaks in the context of the Sri Lankan conflict. We attempt to identify what, if any, identifiable events correspond to these regime changes, particularly those changes in the time paths of the asset values. We also compare the predictive power of our technique using equity index values to alternatives indicators. Specifically, the alternative predictors considered are the survey-based Peace Confidence Index (PCI) for Sri Lanka, published bi-monthly by the Center for Policy Alternatives since 2001, and short-term financial assets in the form of exchange rates.

5. Analysis and Interpretation

Recall that we assume that rational agents can assign probabilities to the sustainability of peace negotiated between parties involved in conflict. Changes in internal and external relationships will impact the probabilities agents will assign to the sustainability of peace. If there is a

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we are fairly confident as to the robustness of our procedures.

significant change in the probabilities assigned, we would expect to see a change in behavior, as reflected by a change in observable indicators of expectations. The empirical analysis in the previous section suggests a number of specific regime shifts in our asset price data. In sub-section 5.1 we match the dates of the regime shifts identified in our empirical analysis to events that changed the relative probabilities assigned to conflict and resolution, and then determine the extent to which those changes in expectations reflected observable long-term changes in the prospects for peace. In sub-section 5.2 we compare the results of our analysis to methodologies based on alternative indicators of sustainable peace —survey data, exchange rates, and casualty numbers.

There are three dates, in particular, that seem to indicate structural change: October 2001, November 2004, and November 2005. The first regime shift represents a positive innovation, indicating an increase in the probability of sustainable peace. The latter two, however, were negative shifts from the previous mean, suggesting an increase in expectations of unsustainable peace. All three dates maintain statistical significance even when the other break dates are taken into account. Our aim in the following subsections is to understand the context of events that resulted in changes in the perceived sustainability of peace, and to determine whether our index is a useful predictive (leading) indicator of actual changes in the relative probabilities of conflict and peace.

5.1 Event Studies

5.1.1 October 2001

As a result of the attacks on the United States by the terrorist organization Al Qaeda, the United

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[8] Furthermore, a Levene test based on analysis of variance (ANOVA) of the absolute differences in sub-sample means (see Levene 1960) suggests that these changes in variance are also jointly significant at 5% level.

Nations passed Resolution 1373 on September 28, 2001. The resolution set a framework for the international community regarding terrorism. In particular, the resolution advocated freezing sources of funding, combining the resources of the international community, and monitoring all organizations that used terror as part of their operations. Under this resolution the LTTE was named as a terrorist organization.

Soon after Resolution 1373 was passed, both Canada and the United Kingdom publicly named the LTTE as a terrorist organization. The increased international publicity and pressure raised the cost to the LTTE of using violence to achieve their desired end. In other words, the actions of the international community increased the net benefit of the LTTE committing to the peace process. The Sri Lankan government realized the LTTE was now going to find it difficult to secure international funding, providing an incentive to negotiate toward a sustainable peace (Raman 2002). At the same time, however, the Sri Lankan government was in the midst of a recession and unable to advance any significant military objective. The regime shift that occurred in October 2001 seems to indicate that agents recognized that the LTTE was likely to commit to the peace process because it was "unlikely to carry out major attacks in view of the post September 11 global situation, [and that] the change in stance by the international community…" presented a binding constraint on the actions of the LTTE (Chandrasekharan 2001a). In Prabhakaran's Heroes' Day speech (November 27, 2001), the political leader of the LTTE indicated that his group "is not 'the run of the mill terrorist outfit' but that it is fighting for a noble cause and that one has to distinguish the freedom fighters from those who commit blind terrorist acts based on fanaticism" (Prabhakaran quoted in Chandrasekharan 2001b). Prabhakaran's speech can be seen as an attempt to signal to the Sri Lankan government and to the international community that the LTTE was committed to finding some form of long-term

peace.

Within the context of an international community pushing to eradicate the funding of terrorism, and the perception by the government of an intractable stalemate, both sides agreed to Norway-brokered peace talks in November of 2001. The apparent commitment of the parties to finding sustained peace increased due to exogenous international pressures. Three months later the ceasefire agreement (CFA)—the first such agreement since 1997—was reached. Our analysis of the asset price data shows a change in expectations regarding the feasibility of sustained peace four months before the CFA.

5.1.2 November 2004

Just over three years after the first regime shift is detected, a second shift occurs. Unlike the first one, however, our analysis shows agents perceiving a reduction in the commitment to sustainable peace by one or both of the parties. This change of expectations in late 2004 appears to be solely the result of domestic influences. Two inter-related incidents provided agents with information that changed the probabilities they assigned to the parties' commitment to the cease fire agreement.

First, the governing-coalition partner, the United National Party (UNP), publicly stated that they would not support the peace process. Second, the LTTE's leader replied that if the Sri Lankan government did not come back to the peace talks, they would have "no alternative but to advance the freedom struggle…" (Marwan-Markar, Nov. 18, 2004). Importantly, the peace process had at this point already been stalled for 19 months, but it was the revelation that President Kumaratunga could not form a consensus government without the UNP, in conjunction with the growing impatience of the Tamil leadership, that ultimately changed people's

perceptions about the sustainability of the cease fire agreement. Tamil National Alliance MP Jeyanandamoorty even proclaimed, "Sinhala parties will never come to a consensus on a political settlement to the ethnic conflict. It won't happen even if the Tamils wait patiently for another 50 years" (Marwan-Markar, Nov. 18, 2004). The combination of these events led to a change in expectations regarding the stability of peace over time.

This regime shift illustrates the value of financial assets as an indicator of sustainable peace prospects. As with the previous regime shift, the asset prices seem to precede any general change in attitudes by the public, though confidence decreases rapidly in the first half of 2005 (see section 5.2 for a discussion of survey data).   In fact, due to the instability of the Sri Lankan government and the continued demands of the LTTE for the Interim Self-Governing Authority (ISGA), neither side was demonstrating a commitment to the peace process—although neither side had yet actively re-engaged in armed hostilities.

5.1.3 November 2005

On September 22, 2005, the LTTE publicly announced that agreements signed by the Sri Lanka Freedom Party (SLFP) presidential candidate Mahinda Rajapaksa, the People's Liberation Front (JVP), and the National Heritage Party (JHU) precluded the possibility of finding a negotiated solution to the national question of constitutional autonomy for the LTTE-controlled areas.[9] On November 19, Rajapaksa was sworn in as the new President. He won the election, in part, because the Tamil minority—at the insistence of the LTTE—boycotted the elections.

The JVP did not immediately join Rajapaksa's government to form a coalition, despite earlier indications that they would. Specifically, the JVP stated that they "would wait and

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[9] We have used the English translations for the political parties here. In Sinhalese they appear as Janatha Vimukthi Peramuna (JVP) and Jathika Hela Urumaya (JHU), respectively.

observe the way the new President performs" before they decided to join his government (Daily Mirror, November 21, 2005). The lack of a broad-based coalition prevented the government from returning to the peace process, and this news resulted in a seven percent drop in the CSE's ASPI Index for the week following his victory. Agents perceived this as a sign that the Sinhalese government had little ability to make peace, and the LTTE boycott ensured that only the Sinhalese voice was revealed in the election. The cumulative perception was that sustainable peace was not feasible. Moreover, long-term asset prices reacted faster than alternative indicators of expectations, as evidence by the fact that public confidence, as indicated through surveys, did not drop until the end of 2006 (see subsection 5.2).

5.2 Alternative Indicators of Sustainable Peace Prospects

In an effort to check for the robustness of our long-term financial indicators we turn to other measures for comparison. We use three specific and common measures—casualty numbers, survey data, and exchange rates. We discuss each in turn.

Casualties serve as one proxy for the level of tension and violence in a society.[10] When parties commit to sustainable peace, we would expect to see a reduction in conflict and casualties. Likewise, when sustainable peace is absent, we would expect the number of casualties to increase. Given this, we can compare casualties to various indicators of sustainable peace to check the robustness of long-term financial assets versus other potential indicators. If our theory and empirical analysis is correct, long-term financial assets should do a better job predicting changes in casualties, and hence peace prospects, as compared to alternative

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[10] There are other measures that could be used as proxies for conflict intensity and war damage. Some of these include conflict damage in dollars, number of acts of terror, number of suicide attacks, child conscription. For completeness and the availability of data we found casualty numbers to be the most appropriate. Further, the use of casualties as a proxy for the level of conflict (or peace) also has precedent in existing literature (see Nincic and

indicators.

Figure 4 shows the number of casualties per month for 2000-2007 (left scale) plotted against the average monthly closing price of Sri Lanka's stock market (right scale). The bold vertical lines highlight the three regime shifts identified in our empirical analysis.

INSERT FIGURE 4 ABOUT HERE

In October 2001, the location of the first regime shift identified, 169 casualties were reported, which was the third highest total for the year. The following month saw the number of casualties decrease to 132, while there were only 15 casualties during the entire 2002 year (after the CFA was signed in February). This suggests that the ASPI market index prices accurately predicted the improving prospects for peace subsequently indicated by falling casualty rates.

The subsequent regime shifts in November 2004 and 2005, respectively, also anticipated significant changes in casualty rates, but these cases involved decreases, rather than increases, in expectations regarding sustainable peace. The results were increases in the number of casualties. For example, the average number of monthly casualties jumped from 9.1 in 2004 to 27.5 in 2005, an increase that was anticipated in financial markets in November 2004 (a month which itself saw no casualties at all). By the end of 2005, the casualty rate was increasing yet again and, despite a brief respite in the acceleration of conflict early in 2006, participants in the national stock markets correctly anticipated an almost total breakdown in the peace process—a breakdown which is clearly illustrated in the skyrocketing casualty rates that were occurring by the middle of that year. Note that in all three cases, observable (*ex post*) changes in the prospects for peace were correctly anticipated in long-term financial asset markets three to six months

Nincic, 1995; Feaver and Gelpi 2004).

before the results of those changes were demonstrated.

One of the most common indicators of expectations regarding conflict or peace is survey-based data such as the aforementioned Center for Policy Alternatives' Peace Confidence Index (PCI). Surveys, however, suffers from several problems. First, they are subject to potential reliability problems due to the fact that the costs and benefits of correct (or incorrect) forecasts do not accrue to the forecasters themselves. In other words, there is no link between the production of the forecasts and the consequences of being right or wrong. Further, surveys are only updated periodically, meaning they do not capture 'real time' changes in events and related expectations. Because of these issues, we would expect stock markets to better reflect changes in expectations regarding the sustainability of peace prospects.

In order to test this prediction Figure 5 provides bi-monthly PCI survey data compiled by the Center for Policy Alternatives (left scale) plotted against the total casualties (right scale) for May 2001 through October 2007. The "GoSL" trend line represents the percentage of respondents that answered "Agree" when asked if they believe the government is committed to peace through talks. The "LTTE" trend line represents the percentage of respondents that answered "Agree" when asked if they believe the LTTE is committed to peace through talks. The bold trend line indicates the number of casualties.

INSERT FIGURE 5 ABOUT HERE

As Figure 5 indicates, the survey responses are mixed as indicators of peace prospects. For the first date of interest, October 2001, the survey responses indicate that respondents believed that peace could be sustainable. This is supported by the fall in casualties. However, for the other

two dates—November 2004 and November 2005—surveys are an unreliable indicator of sustainable peace. For example, as of November 2005, surveys indicated that respondents perceived both parties as being committed to the peace process. However, as the trend line indicates, the number of casualties increased in subsequent months. Note that long-term financial asset prices captured evidence that peace was unsustainable for both the November 2004 and November 2005 dates. Relative to the ASPI, survey responses appear to be a lagging indicator of sustainable peace.

One problem with survey data that may explain its failure as an effective leading indicator is that such data is particularly prone to Type I (false positive) and Type II (true negative) forecast errors. Willard, Guinnane, and Rosen (1996: 1) note in their study of Civil War gold-market trading that "financial markets reacted strongly to several events that have not been assigned a central place in Civil War histories, and some events viewed as turning points by historians did not stir the financial markets." In the same way that historians are liable to make such errors after the fact—even working with the best available information about what agents thought at the time—survey participants can fail to fully understand the implications of events on the ground as they occur, and often either over- or under-react to potentially important news.

As an example of this logic, consider the second regime shift—November 2004—discussed in the previous subsection. Recall that long-term asset prices reflected expectations that peace was unsustainable. However, a review of the survey data indicates that the general public's attitude toward peace during this period remained unchanged. What explains the divergence between long-term asset prices and the perceptions of survey respondents? One potential explanation is the meeting of the Co-Chairs of the Tokyo Donors Conference held in June 2004. This meeting generated considerable optimism among the general public, but no

reaction among asset holders.[11] At this meeting, the Co-Chairs, while expressing concern over the stalled peace process, commended both sides for maintaining the CFA. Based on these public comments, survey evidence indicates that the general public had a different and less accurate assessment of the prospects for peace than asset holders. It appears that the general public incorrectly believed there would be a coordinated effort by both parties to return to peace talks. People believed that the international pressure placed on the Sri Lankan Government and the LTTE to negotiate was going to be enough to sustain the CFA. Even in December 2004, as peace talks remained stalled, and the Co-Chairs specifically condemned the Sri Lankan Government's political infighting, the general public continued to believe the CFA was sustainable. In fact, between June of 2004 and March of 2005 there was a sharp increase in the percent of survey responses that believed the warring parties would go into peace talks because of international pressure.

The over-reaction of survey respondents to the Tokyo Donors Conference highlights the fact respondents' views tend to reflect the full impact of an event only after the results of that event begin coming to fruition. Furthermore, asset market participants have financial incentives to correctly forecast the impact of news much more quickly than survey participants. McCandless (1996: 203), studying the same Civil War gold markets, quotes Mitchell (1903) in suggesting that the "failures and successes of the Union armies were recorded by the indicator in the gold room more rapidly than by the daily press."

Another alternative indicator of peace and conflict is short-term market indicators, such

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[11] The initial Tokyo Donors Conference was held in June 2003. At the end of this meeting an international group of donors pledged $4.5 billion to Sri Lanka. This money was to be distributed evenly between the Sri Lankan government and the LTTE-controlled areas. The money, however, was predicated on both parties commitment to the peace process. Following the initial conference, the Co-Chairs would meet intermittently to evaluate the peace process. The June 2004 statement was an outcome of one of these meetings.

as exchange rates, that are thought to be more sensitive to real-time activities as compared to stock indexes. Indeed, exchange rates are routinely used to indicate market reactions to economic, political, and social events (see for example, Sobel 1998) of importance for long-run stability. Short-term asset markets, like the foreign exchange market, improve upon surveys by internalizing costs and benefits. At the same time, they suffer from other problems having to do with their sensitivity to factors that reflect short-term, policy-induced influences rather than long-term fundamentals. In particular, central bank and treasury policies can alter the currency exchange landscape by smoothing or offsetting movements induced by changes in underlying fundamental values. Because of these issues, it is our contention that stock markets, which are relatively free of such direct interventions, are thus better able to reflect changes in expectations brought about by changing perceptions of sustainable peace.

Given this, how do exchange rates compare to stock prices in the context of Sri Lanka? Figure 6 shows the exchange rate for the Sri Lankan Rupee in US$ (left scale) plotted against the ASPI (right scale) for 2000 – 2008. Figure 7 again plots the Rupee in US $ (left scale) against the total casualties (right scale) for March 2000 through October 2007.[12]

INSERT FIGURE 6 ABOUT HERE

INSERT FIGURE 7 ABOUT HERE

Figure 6 indicates that participants in the ASPI began to bid up long-term asset prices prior to a change in the public's perceptions of sustainable peace as expressed by the exchange rate. As Figure 7 indicates, the movement of the exchange rate does map to changes in casualties to some

degree. However, the exchange rate movements are relatively small, especially when compared to changes in the ASPI (Figure 6).

One might wonder why the exchange rate indicator is not more robust given the successful use of such indicators in the previous studies of expectations discussed in Section 2. This is, we believe, a product of our technique in which we do not assume *a priori* that we know where the sustained movements in long-term asset values are potentially located; instead, we allow the data to tell us what asset price movements appear to be sustained (based on our window length choices) and which ones are not. Studies like the ones by McCandless (1996) and Sobel (1998) typically identify potential events first, and then attempt to ascertain whether the data suggests a break at (or soon after) that point. So, these studies are asking the question: is our event one (of many) which market participants reacted to? Exchange values will generally exhibit these effects accurately because, as primarily short-term, non-fixed investments, they will react in response to many influences, including events relating to sustainable peace and conflict resolution. Therein lies a problem, however; exchange rates will often be far too sensitive to act as a *predictor* of which events will turn out to be important. They tend, instead, toward sharp reactions followed by reversals. In other words, they are highly mean-reverting.

The aforementioned Tokyo Donors Conference in June 2004 provides an illustration of this logic. The jump in the exchange rate following the conference suggests that participants in the foreign exchange market believed this event to be important. However, as the peace talks remained stalled and the members of the Tokyo Donor's Conference voiced frustration in December 2004, by January 2005 exchange rates had retreated back to their May 2004 level.

Our methodology is somewhat different. We are in search of an index that can tell us which events will be important as indicators of changes in expectations of conflict resolution,

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[12] Exchange rate data was compiled from the Central Bank of Sri Lanka, http://www.cbsl.gov.lk/info/_cei/er/e_1.asp

and thus in sustainable peace, as they occur. We do not assume any particular event is important—the process of identifying important events is entirely data-generated. To accomplish this, we need forward-looking, long-term asset prices that exhibit both deterministic and stochastic trends. In other words, fixed asset prices are better indicators of changes in sustainable peace precisely for the reason that their long-term properties do not tend to change frequently (although they can certainly fluctuate in the short term).

Of course, the indicators considered are not mutually exclusive. Long-term financial assets can be used in conjunction with other indicators to provide a more complete picture of expectations regarding the resolution of conflicts. Our contention is that claims on fixed assets provide the best indicator of true expectations and, thus, of sustainable peace.

6. Conclusion

Our analysis has important implications for efforts to assist countries in breaking free of the conflict trap. Understanding and formulating an effective policy toward conflict-torn areas requires finding mechanisms that reveal expectations regarding sustainable peace. Our analysis indicates that long-term financial assets are one such mechanism. These assets provide a forward-looking, single index which reflects expectations regarding the sustainability of peace. Policymakers can use these assets to inform policy decisions regarding the allocation of resources. For example, where long-term assets indicate that peace is not sustainable, policymakers may consider allocating resources to prevent or minimize the ensuing conflict.

Although our empirical analysis focused on Sri Lanka, the implications of our study can be extended to all cases of conflict and efforts to achieve some form of sustainable peace in conflict-torn areas. Our analysis indicated that long-term financial asset prices are accurate

indicators of the sustainability of peace. However, when indicators of long-term assets are unavailable, other indicators (short-term assets, surveys, etc.) can be employed. While not necessarily as reliable as long-term, fixed assets, these alternatives can provide some insight into the sustainability of peace.

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October 2001	November 2004	November 2005
β_1=73.5**(2.76)	β_1=-66.4**(7.00)	β_1=-457.7*(1.90)
β_1=95.8**(4.17)	β_3=-90.8**(3.80)	β_5=-392.6*(1.95)
β_2=27.8*(1.87)	β_4=17.3 (0.63)	β_6=-71.8**(2.36)

** (*) indicates significance at the 5% (10%) level. The dependent variable (differenced closing monthly index value) is regressed on a constant, trend, and dummy variables representing possible breaks in the intercept (odd-numbered coefficients) and trend (even-numbered coefficients) of the variable. Z-statistics are in parentheses.

Table 1: Maximum Likelihood GARCH results for breaks in monthly index

October 2001	November 2004	November 2005
F=9.31**(0.00)	F=4.51**(0.00)	F=19.44**(0.00)

** indicates significance at the 5% level. Tests are for equality in the sub-sample variances with a null hypothesis that the ratio of variances is equal to one. F-values are distributed chi-square with N_1-1 numerator degrees of freedom and N_2-1 denominator degrees of freedom. Probability levels are in parentheses.

Table 2: Tests for changes in variance of monthly index values
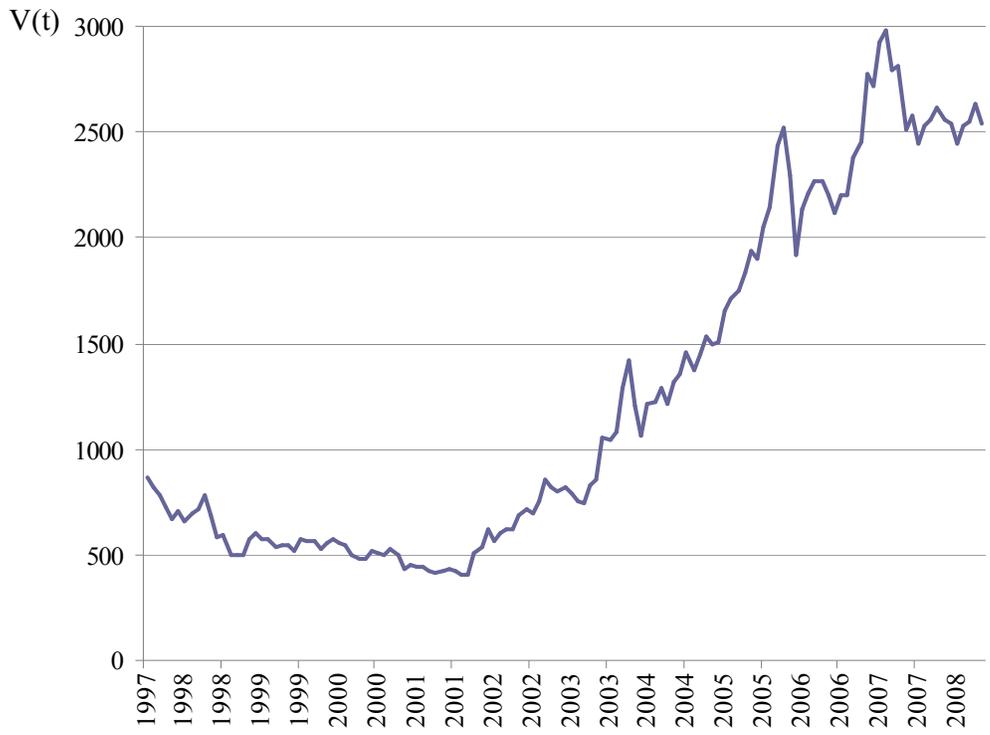
Figure 1: Monthly stock market index values, July 1997-May 2008
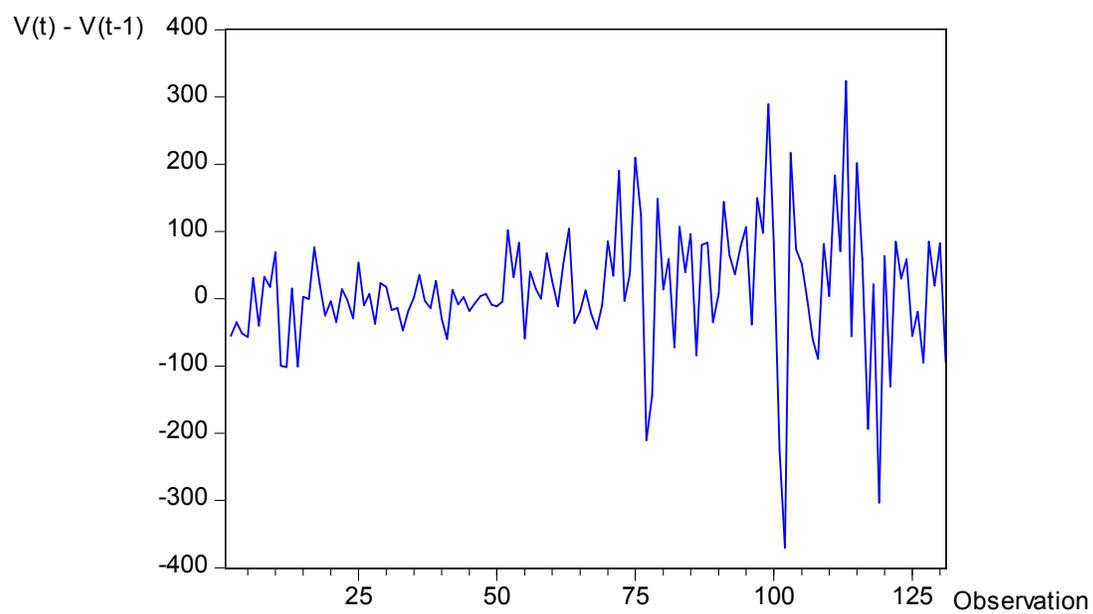
Figure 2: Differenced stock market index values
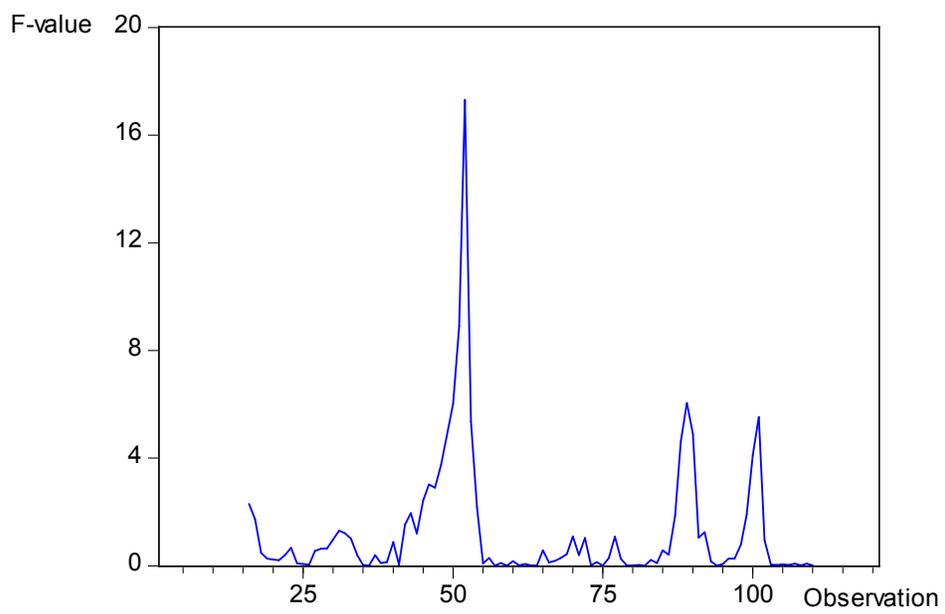
**Figure 3: Rolling regression F-values for two-year windows**
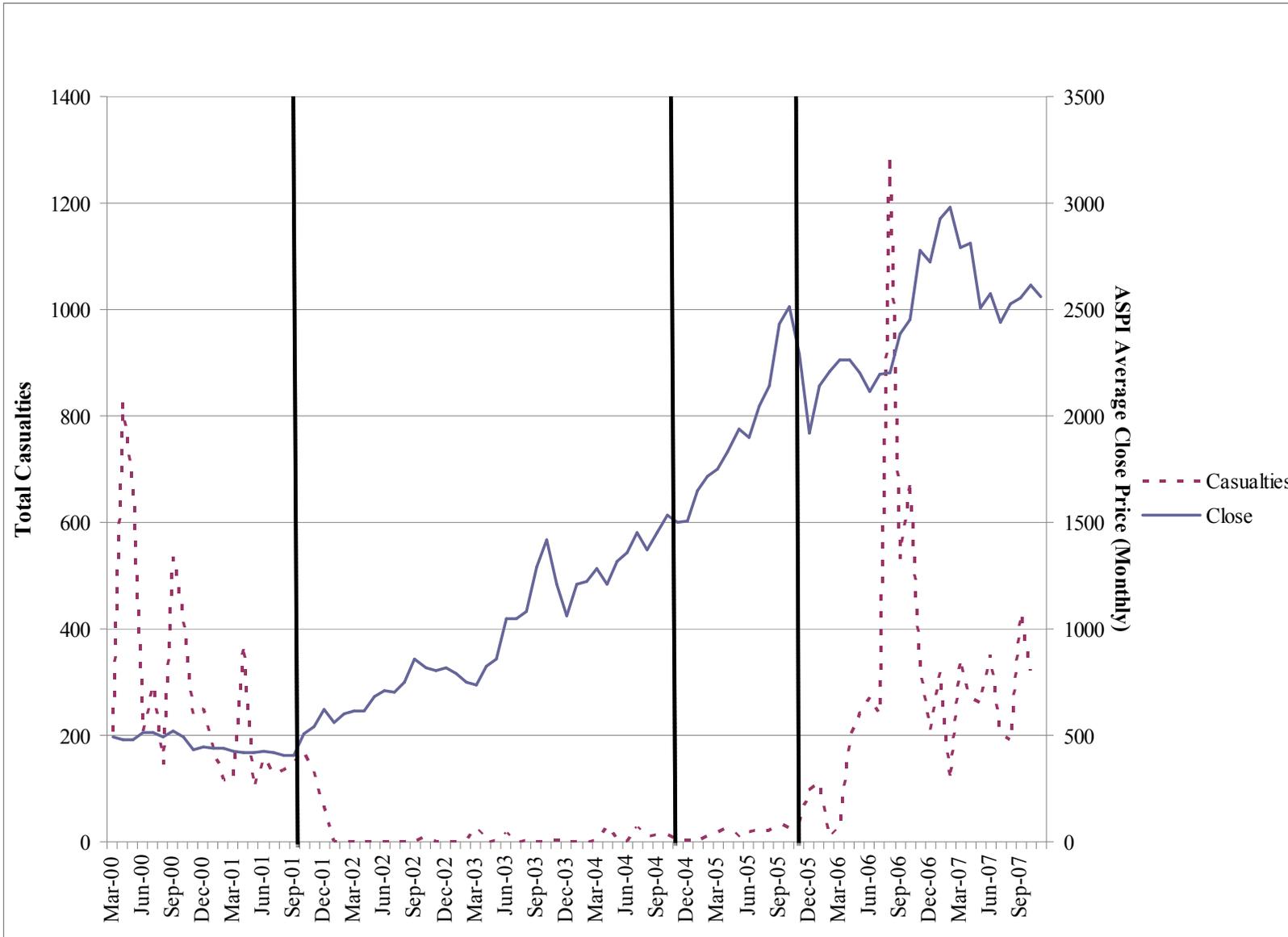
**Figure 4: ASPI Close and Total Casualties per Month, 2000-2007**
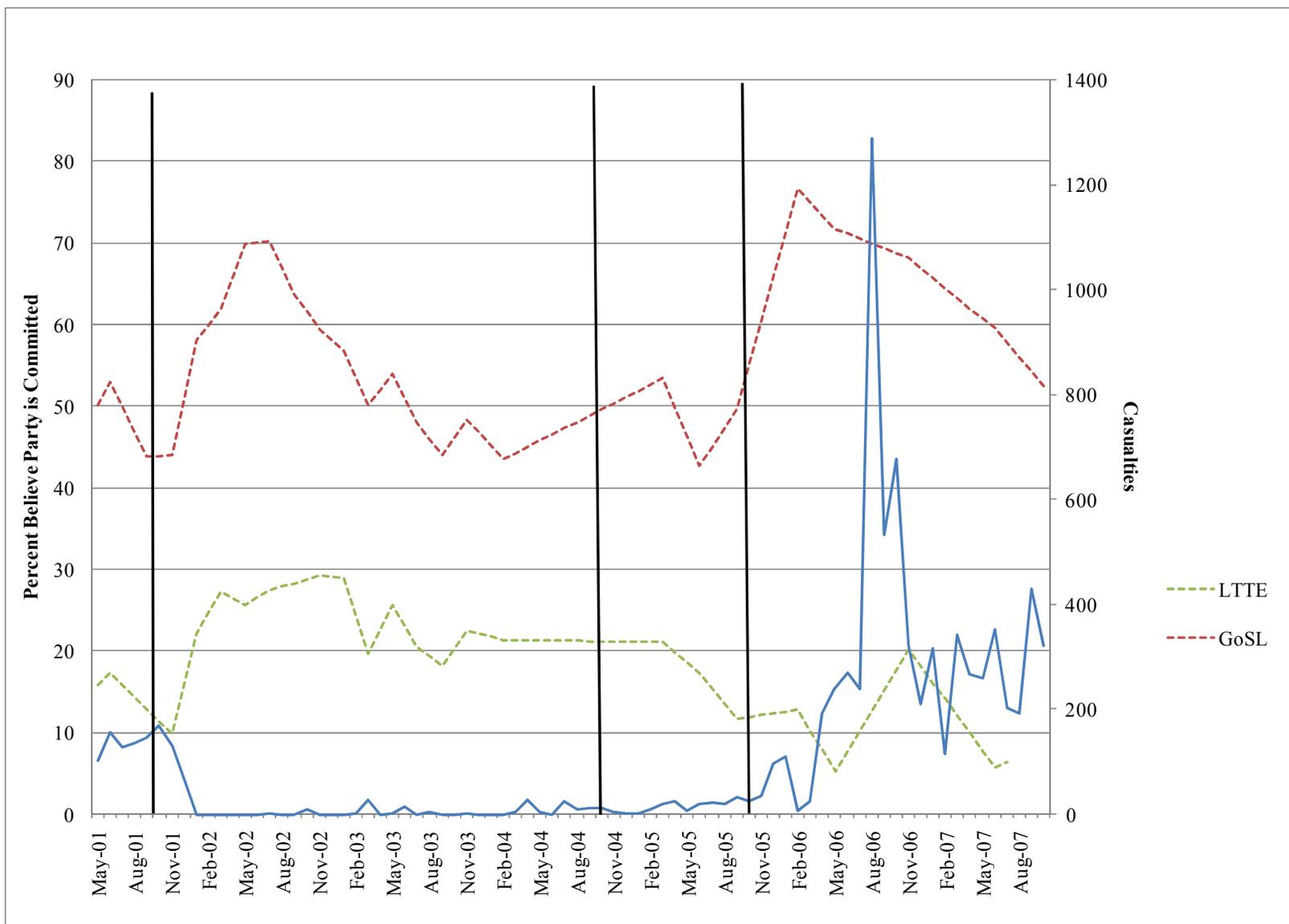
**Figure 5: Total Casualties per Month and Peace Confidence Index (PCI) Data, 2001-2007**
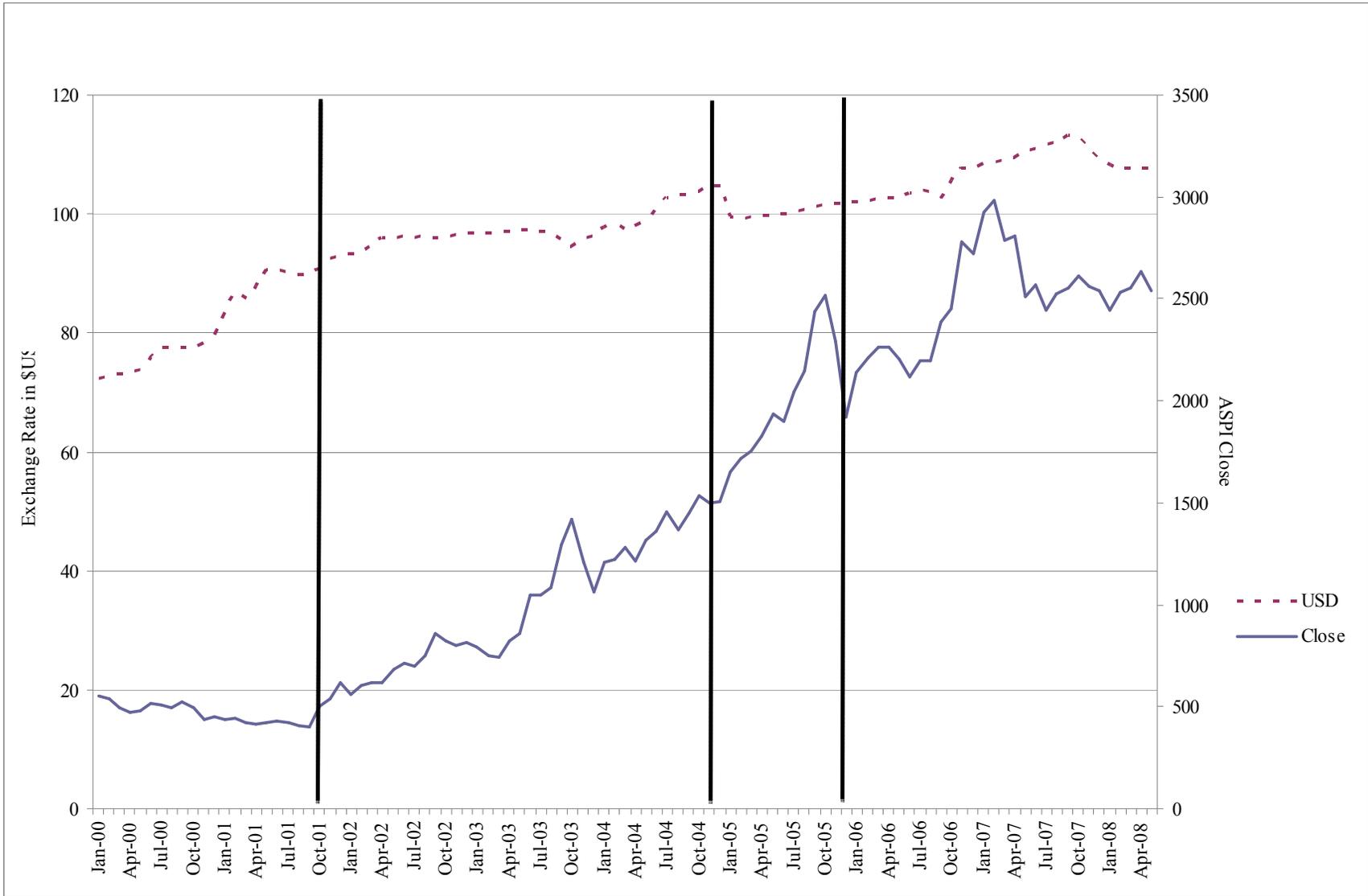
**Figure 6: ASPI Close and Exchange Rate data, 2000-2008**
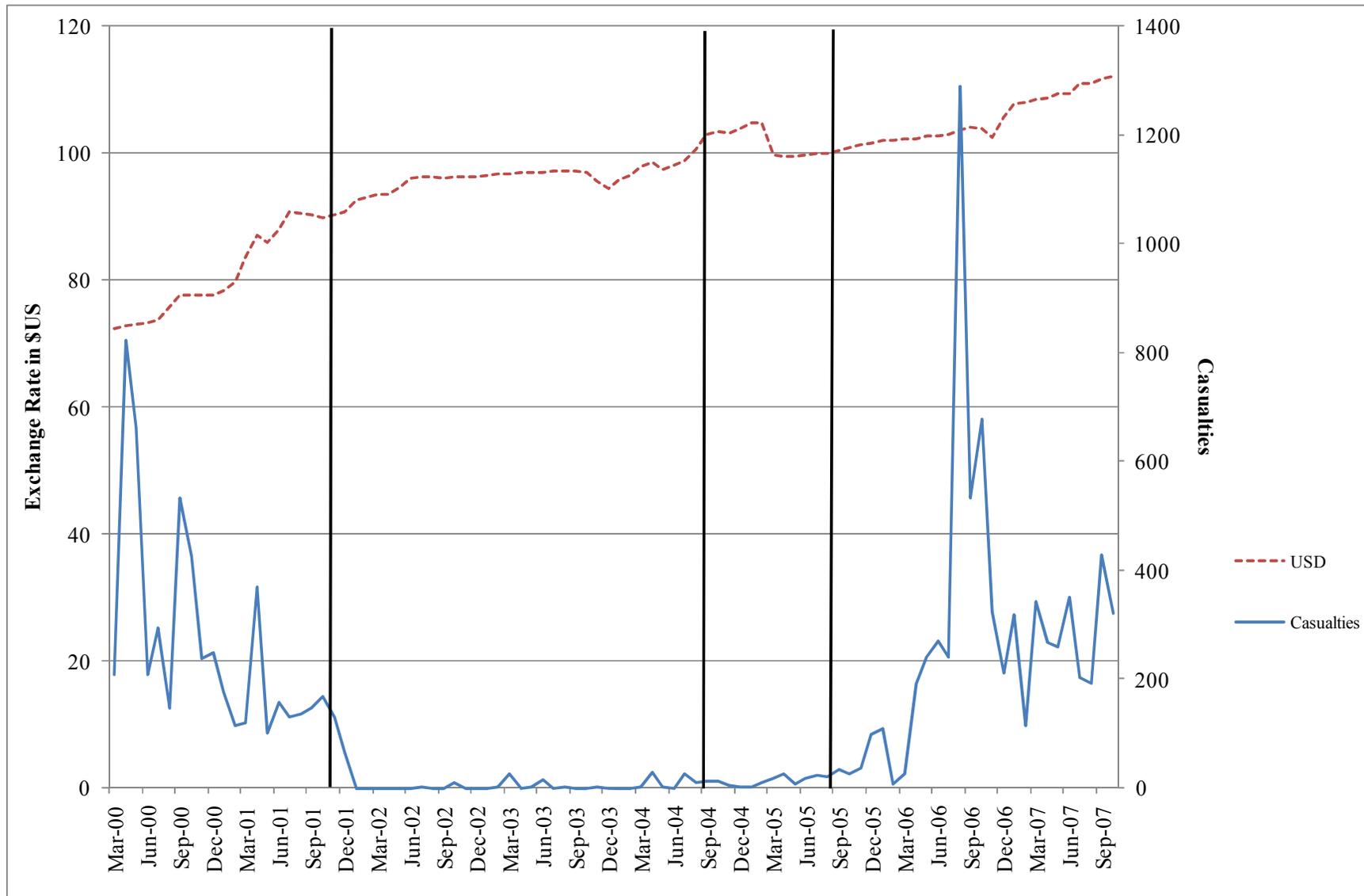
Figure 7: Total Casualties per Month and Exchange Rate Data, 2001-2007