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Turning Points in the Civil War: Views from the Greenback Market

By KRISTEN L. WILLARD, TIMOTHY W. GUINNANE, AND HARVEY S. ROSEN*

“I wish every one of them had his devilish head shot off!”

—Abraham Lincoln on gold-market traders¹

The goal of this paper is to determine which events of the U.S. Civil War were viewed as turning points by people at the time. Our basic source material is quite different from that employed in conventional histories: rather than letters, diaries, speeches, and other verbal statements, we use asset prices. The United States issued an inconvertible currency called the Greenback starting in 1862. The Greenback's value in gold fluctuated over time, reflecting the expectation of future war costs. Using data on the gold price of Greenbacks, we compare the reactions of participants in financial markets to the significance the same events have been assigned by Civil War historians. This is not a conventional event study. Instead of specifying a list of dates a priori and testing for their importance, we allow the data to identify the important dates, and compare

them to the accounts of traditional historians.² Our method agrees with conventional histories for some events, such as the Battle of Gettysburg, but also generates some surprises. 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 addition to our findings about specific events in the Civil War, our results emphasize a more general point: even with the benefit of hindsight and a rich understanding of the entire period, historians' standard methods may not lead to an accurate assessment of how contemporaries viewed events.

To say that an historical event is important can mean one of two things: an event may be important to us as later observers, or the event might have been important to people who lived at the time. Modern observers with the benefit of hindsight often think an event was important largely because we know its role in later chains of events: the assassination of Archduke Ferdinand in 1914 might seem an isolated example of Balkan violence were it not for its role in starting World War I. Similarly, the Wannsee meeting in January 1942 appeared to uninvolved contemporaries as one more assemblage of Nazi bureaucrats. At the same time, modern observers may downplay an event that was significant to contemporaries, perhaps because of their inability to appreciate fully the thoughts and fears of those who lived in another time. Recent historiography has sought to bridge this gap, or at least to reassert the importance of knowing how events were perceived when they occurred. In the spirit of such research, we compare the

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¹ Quoted in F. B. Carpenter (1867 p. 84).

² For a detailed event study of both the Civil War and postwar periods, see Gregor W. Smith and Todd R. Smith (1994).

reactions of participants in financial markets to the significance the same events have been assigned by Civil War historians.³

Because asset prices are determined by people who are "putting their money where their mouths are," the reaction of market prices (or lack thereof) to various events is a strong indication of the sentiments of market participants. This approach uses a basic tenet of information and financial economics: information that affects a security's expected payoff is incorporated into its price. Indeed, the relative simplicity of the market we study makes it easier to examine what kind of information moves asset prices than it is for analysts using contemporary data.

Even after the appearance of Greenbacks, business people required gold dollars to complete international transactions and to pay some obligations to the U.S. federal government. A market emerged in New York to facilitate conversions between Greenbacks and gold dollars. The records of this market—daily quotations on the relative prices of Greenbacks and gold dollars—form our basic source.⁴ Our selection of the Greenback market, as opposed to some other financial market, is based on several factors. First, the exchange rate between gold and Greenbacks allows us to "measure the opinions of individuals who are no longer alive to express them directly" (Richard Roll, 1972 p. 498). People hoped that after the war they could convert their Greenbacks to gold dollars one-for-one. The longer and more costly the war, the more likely it was either that this conversion would not take place or that the United States would return to the gold standard at a different parity, in effect using inflation to raise some of the

funds necessary to pay for the war. Thus, the Greenback's price, in terms of gold, provides a running commentary on the Union's fortunes, as perceived by participants in financial markets.^{5,6}

The Greenback market has another important virtue: studying it permits us to avoid a complication that would arise in connection with virtually any other market (such as that for a railroad or bank security). The connection between war events and the price of any single financial security reflects idiosyncracies of the particular security. In the case of a railroad security, for example, a Union victory in some battle might raise the security's price because it implies a shorter war and a faster return to a peacetime economy. On the other hand, it might lower the price if some of this particular railroad's property was destroyed during the battle. Hence, the movement of the price of such a security is a poor index of views on the probability of a Union victory.

The United States did return to the gold standard at the prewar parity, but not until substantially after the war's end, on January 1, 1879. In principle, one could also study Greenback prices during the postwar period; indeed, Milton Friedman and Anna J. Schwartz (1963) provide an excellent discussion of the Greenback's postwar career. However, we limit our study to the Civil War period for two reasons. First, there is a well-developed historiography of the Civil War that permits us to assess the importance ascribed by historians to

⁵ The same phenomenon exists in modern financial markets. Thus, in 1994, a senior advisor to President Clinton was quoted as saying "The value of the dollar on any given day is like a global referendum on all the policies of the Clinton Administration combined" (*New York Times*, 8 May 1994, p. E5).

⁶ Clearly, it would be most interesting to incorporate data on Southern asset prices into the analysis. The data, however, are much poorer: see George T. McCandless (1996). Nevertheless, there is a related literature on the Confederacy. Richard C. Burdekin and Farrokh K. Langdana (1993) take advantage of information from the nine Treasury reports issued by the Confederacy and discuss the implications of war news for Confederate inflation rates. Herchel I. Grossman and Taejoon Han (1996) provide a thoughtful analysis of moral-hazard problems in Confederate borrowing. Larry Neal (1990) is similar to the present paper in its focus on the transmission of information in historical financial markets.

³ In a similar spirit, Jeffery G. Williamson (1981) and John Brown (1990) estimate hedonic wage functions for nineteenth century Britain to estimate the compensating differential for living in a large town. In effect, this method allows workers to reveal their preferences through their actual decisions.

⁴ We will always refer to the price of *Greenbacks* in *gold dollars*. Thus, increases in the Greenback/gold rate are movements *toward* par and may be seen as increases in the value of Greenbacks. Contemporaries and historians usually refer to the "price of gold," or the inverse of our measure.

events that may have occurred on any given day. Second, by its very nature, the war generated well-defined discrete incidents that are easier to characterize as surprises to contemporaries. Having said this, we still believe that exploring the post-Civil War data provides a potentially useful check on the appropriateness of our method. Hence, although they are not our main focus, we briefly report some findings for the post-Civil War era.

In Section I below we provide more background, describing the New York gold markets and how they functioned. In Section II, we review some previous studies of the gold market. Section III describes our econometric method. Our results, presented in Section IV, can be viewed as a set of "Civil War greatest hits" that we can compare to more conventional historical accounts. Section V concludes.

I. Greenbacks and the Market for Gold

During the first year of the Civil War, 1861, the Union's financial condition deteriorated, and in December the Treasury issued a very bleak report on the budgetary situation. In the face of such news, bankers concluded that investors would lose confidence in bank notes and that banks would soon experience a massive outflow of gold. On December 30, the banks suspended the convertibility of their notes into gold (Davis Rich Dewey, 1939 pp. 182–83). The government almost immediately followed suit, suspending the right to convert Treasury notes into specie. Soon thereafter, in February 1862, Congress passed the first of the Legal Tender Acts.⁷ These acts authorized the government to issue an inconvertible currency popularly called "Greenbacks." Did people believe that the government would eventually redeem Greenbacks for gold? As Irwin Unger (1964 p. 16) noted, "Little had been said on the subject of redemption when Congress debated the Legal Tender" issue. However, all the available evidence indicates that the public believed that at some future date, convertibility would be reinstated, and all

Greenbacks would be redeemed in gold.⁸ As the *New York Herald* (24 September 1862 p. 8) said:

... if we can terminate the war by suppression of the rebellion, and the restoration of the Union on a permanent basis, conversions of currency will proceed so fast that it will very soon become practicable, by a resort to the usual measures, to effect a general resumption of specie payments and a general reconstruction of our commercial edifice on a specie basis.

Greenbacks and gold dollars were not perfect substitutes. First, transactions with foreigners required gold. Moreover, the government itself accepted only gold dollars for payment of customs duties. Finally, and most important, gold was demanded for speculative purposes. Although the Greenbacks represented promises to pay gold coin, "men did not esteem such promises as equivalent to gold itself after the promisors had given public notice that they were unable to redeem their promises for the present" (Wesley C. Mitchell, 1903 pp. 182–83). After a short time the Greenback depreciated from par with the gold dollar, and speculators began to bet on the Greenback/gold exchange rate.

Not surprisingly, a formal market for trading gold came into existence within two weeks of the suspension of convertibility. The price of a Greenback depended on its expected value in gold dollars. The first organized dealings took place at the New York Stock Exchange on January 13, 1862. At about the same time a second market formed in a basement on William Street in New York City. This market, whose venue changed several times, became known as the Gold Room.⁹ The prices in the Gold Room were regularly telegraphed to all major cities and accepted as authoritative. Except during a short period in 1864 when the

⁸ For further discussion of this point, see Walter T. K. Nugent (1967 p. 26). For more on the Greenback and monetary reform during this time, see Charles W. Calomiris (1992a, b).

⁹ Gold was also traded in several locations other than the Stock Exchange and the Gold Room. See Mitchell (1903 p. 184).

⁷ For a discussion of the Legal Tender Acts, see Dewey (1939 pp. 284–90).

government shut it down, the gold exchange operated until redemption in 1879.

We know of no statistics on the volume of gold transactions, but according to Mitchell (1903 p. 184) the volume was "very great." Contemporary accounts emphasized how universal the speculation was:

Lawyers and editors, clergymen and doctors, learned professors and illiterate store-keepers, bank officers and farmers, dentists and architects, publishers and authors, army paymasters and government clerks, gamblers and gentlemen, saints and sinners—a mighty and a motley host ... rushed to the Gold Room, either *in propria persona* or through the medium of a sweltering multitude of brokers.

—[Kinahan Cornwallis,
1879 p. 4]

Apparently, the decorum of this "motley host" was not exemplary. James K. Medberry (1870 p. 241), for example, observes that "In the days of the war an unexpected victory converted the gold arena into a den of wild beasts."

An important question for our purposes is how the gold market used the information coming to it. Did the financial market react quickly to news that was available, or did it take several days to digest important events? A closely related question is whether news of battles and other relevant events reached all participants at about the same time. Any answers to these questions must begin with the observation that communications during the Civil War were often poor. Important battle news sometimes appeared in newspapers only after substantial delays. Consider, for example, the Battle of Vicksburg. On July 3 the *New York Tribune* published a series of dispatches on the fighting that were dated June 26 through June 28. Indeed, on some occasions the military apparently prevented news from getting into the newspaper at all. In a report on the burning of Chambersburg, Pennsylvania, the *New York Herald* explicitly noted that the government frequently withheld information from the public to minimize alarm and protect intelligence and sources (July 31, 1863 p. 4). Similarly, in a discussion of the Battle of Get-

tysburg published on July 3, 1863, the *New York Tribune* noted "Such accounts of the engagement of Gettysburg as the Government has permitted to pass the wires, although on the whole not unfavorable, are too meager to support any decided opinion, or to require much comment" (p. 4).

The fact that newspapers were slow in reporting war developments does not ipso facto imply that the market responded to events with long lags. There were ways other than the papers to obtain war news:

Members of both Houses [of Congress], and of all political creeds, resident bankers, the lobby agents, clerks, and secretaries, haunted the War Department for the latest news from the seat of war. *The daily registry of the Gold Room was a quicker messenger of successes or defeats than the tardier telegrams of the Associated Press.* A private secretary of a high official, with no capital at all save his position, which gave him authentic information of every shaping of the chess game of war a full twenty hours in advance of the public, simply flashed the words "sell, buy" across the wires, and trusted to the honor of his broker for the rest.

—[Medberry, 1870 p. 245,
emphasis added]

If there was a sufficiently large number of "insiders" competing with each other, then the market would quickly transform war news into changes in the price of Greenbacks, despite the fact that the news was not coming through published sources. The observations of Cornwallis (1879 p. 5), are consistent with this notion:

Almost every individual speculator in the Gold Room, whose transactions were large enough to make it of consequence, had a correspondent at the national capital, who sent him a telegraphic dispatch as occasion required. Sometimes information so communicated was of great advantage to speculators, *but more frequently it had been 'discounted' in the Gold Room before there was time to act upon it, owing to the same advices being simultaneously received by many others* ... [emphasis added]

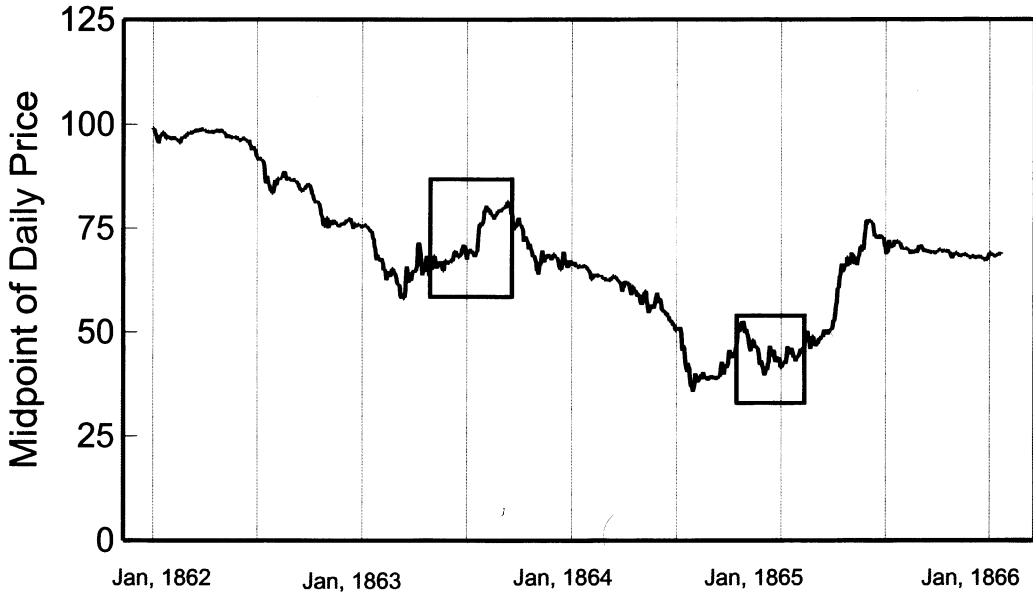


FIGURE 1. GREENBACK/GOLD EXCHANGE RATE

In short, the descriptive accounts support the basic premise of this paper: the gold market transformed information about war news into expectations about the Greenback's future value. Having said this, we should also note that some contemporaries did not view all gold room traders as behaving rationally. Several sources claim that some traders' decisions were guided as much by patriotic sentiments as the desire to make money: "[s]ectional feeling often entered largely into bull and bear contests in the Gold Room, and Union men and rebel sympathizers fought their battles sometimes, as much to gratify this as to make money" (Cornwallis, 1879 p. 7). Of course, the fact that some market participants were not always seeking to maximize profits does not necessarily mean that new information had no effect on prices. Indeed, modern theories of financial markets easily reconcile the existence of noise traders with prices that respond to information.

II. Previous Studies of the Greenback Market

The first systematic analysis of the movement of Greenback prices was done by Wesley Mitchell, as part of his massive study of wages and prices during the Civil War. Mitchell essentially

plotted the price of Greenbacks for the months of the Civil War, producing a graph much like our Figure 1. Mitchell then talked his way through the picture. He noted that the Greenback depreciated until the Union victories of the summer of 1863, and again in the face of setbacks that put the war's outcome in doubt until early 1865 (Mitchell, 1908 p. 15). We use Mitchell's data series and admire his pioneering effort, but depart from his methods in several ways. First, as stressed by Charles W. Calomiris (1988) in his important study of the Greenback, Mitchell's account is predicated on the implicit notion that one should be able to find some "news" to explain every price movement. This, as Calomiris notes, is a serious error:

Ex ante, news is virtually impossible to identify. In deciding what constitutes news the informed researcher and the contemporaneous press on which he draws will look for news where there is much to be explained, much the same way *The Wall Street Journal* seems to explain all market events *ex post* with an R^2 of unity.

—[Calomiris, 1988, note 21]

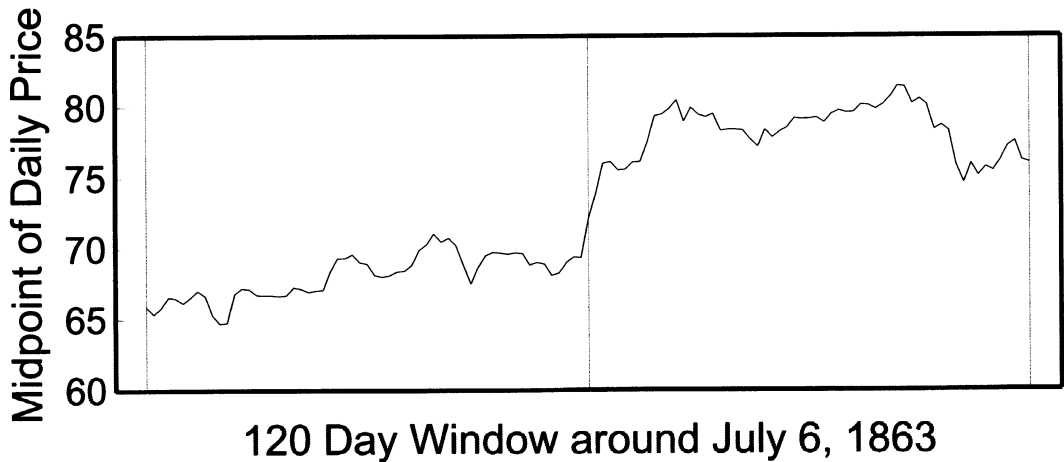


FIGURE 2. EXAMPLE OF A MEAN SHIFT IN THE GREENBACK/GOLD EXCHANGE RATE

In contrast, we do not assume that a significant movement in Greenback prices *has* to reflect significant news, although it can. Our second and third departures from Mitchell's method reflect his lack of an a priori definition of what constitutes a significant change in prices. In any market, prices change from day to day (if not minute to minute), often without any accompanying news. Before attributing a 0.5-percent increase in the gold price of a Greenback to a Union Army victory, we need some formal way to distinguish that 0.5-percent increase from the large number of such increases that might occur just through seemingly random changes in prices due to noise or liquidity trading. The econometric machinery we describe and use below is intended to provide just that formal structure.

Finally, Mitchell did not distinguish between two important *types* of changes in the Greenback price: those that persist for only a day or two (which we call "blips") and those that persist for a much longer time (here called "turning points"). The distinction has great substantive importance. We want to identify events, such as the battle at Gettysburg, that led participants in financial markets to conclude that the war would be shorter or longer than they had previously expected. Figure 2, which is an enlargement of part of the first boxed area in Figure 1, shows a turning point—the shift corresponding to the news

from Gettysburg and from Vicksburg, as a matter of fact. In the space of just a few days, the Greenback's price increased by about 13 percent, and did not experience a significant decline for several weeks. Blips, on the other hand, may reflect a wild market reaction to early news that later turned out to be false; or simply market nervousness over events on which there was little information. Blips of this sort are not uncommon even in contemporary securities markets. In their analysis of modern stock-market data, David M. Cutler et al. (1989) show that some large changes in stock value have no apparent cause. Figure 3, which enlarges the second box in Figure 1, shows a series of blips in late 1864 and early 1865. On virtually every day the Greenback price moved up or down, but these movements were rarely even as much as 0.5 percent and were often swamped by an opposite movement soon after. Since we are primarily interested in long-lasting reevaluations of the prospects for redemption, our focus will be on the turning points. Of course, any statistical procedure for distinguishing turning points from blips will occasionally confuse the two. This issue is discussed below.

More recent discussions of the Greenback have focused on its role as a form of money. Years after the publication of Mitchell's work, Friedman and Schwartz (1963) argued that his basic approach was in error because the

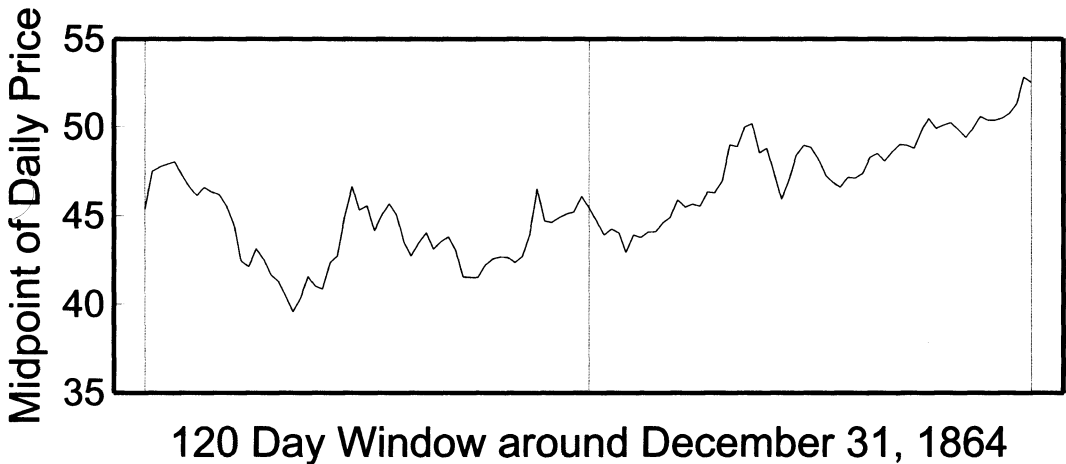


FIGURE 3. EXAMPLE OF BLIPS IN THE GREENBACK/GOLD EXCHANGE RATE

Greenback's price was determined by the supply of Greenbacks and the demand for *money*, of which Greenbacks were merely one type. That is, the conventional variables that are used to explain the demand for money (such as interest rates, nominal income, and so on) should be essential to any analysis of Greenback prices. If Friedman and Schwartz were right—if Mitchell's emphasis on news in determining Greenback prices was misplaced—then there would be little point in a study such as ours. However, in his analysis of the Greenback in the postwar era, Calomiris (1988) argues convincingly that this is not the case. Central to Calomiris's argument is the fact that a third form of money existed in addition to Greenbacks and gold—notes supplied endogenously by banks. Calomiris shows that these bank notes were the marginal money in the sense that changes in the money supply corresponded to changes in the quantity of these notes. Therefore, changes in the demand for money resulted in changes in the quantity of the endogenously supplied bank notes, and so did not affect the relative price of Greenbacks and gold. This analysis supports "... the basic approach taken by Mitchell and others who concentrate on expectations of government fiscal policies during the Greenback era as the main determinants of exchange rates and prices, and through them, money" (Calomiris, 1988 p. 217). In any case, the Friedman

and Schwartz critique is more pertinent to Mitchell's long-run analysis than to our focus on daily changes: it is unlikely that changes in the demand for money were large enough, on a daily basis, to produce the daily fluctuations that we observe. In this light, we proceed on the basis of Mitchell's assumption that expectations about resumption *did* strongly affect the price of Greenbacks.

III. Econometric Method

This section describes our methodology for analyzing the Greenback price data. We also discuss some methodological paths not taken and why. In a generic sense, our problem can be characterized as follows: suppose that a time series is generated by some autoregressive process. Define a "break" in the series as a change in the intercept of that process, that is, a shift in its mean value. How does one determine if there are breaks in the process, and if so, where they are? In our context, the breaks in the price of Greenbacks series mark the turning points of the war: long-lived changes in the price of Greenbacks, conditional on their past values.

In developing a method to find these breaks, one of the central questions we must confront is just how long is a "long-lived" effect on prices? To see why this is important, suppose that there is only one turning point, and we are

attempting to find the date on which it occurred. One way to approach this problem would be to estimate a series of equations like those in Pierre Perron (1989):

$$(1) \quad \ln p_t = \beta_0 + \sum_{i=1}^k \beta_i \ln p_{t-i} + \gamma_s D_{st} + \varepsilon_t,$$

where p_t is the gold price of Greenbacks on day t , $D_{st} = 1$ if the date is on or after date s and zero otherwise, the β 's and γ_s are parameters to be estimated, and ε_t is a white noise error term. For example, if $s = \text{June 1, 1863}$, then D_{st} takes a value of zero for all observations up to but not including June 1, 1863, and it equals 1 for all observations thereafter. In effect, then, γ_s is the magnitude of the mean change that occurs at date s , because for all days after and including date s , the price shifts by γ_s , *ceteris paribus*.¹⁰

Because s was chosen arbitrarily, perhaps no mean shift occurred on that date. This observation suggests the following procedure. Estimate equation (1) repeatedly, each time letting s be a different date. For each such equation, test whether γ_s is different from zero using a conventional F test. Then compare the F tests on all the γ_s 's, and designate the date associated with the highest F statistic as the most important mean shift.¹¹

This procedure, however, was developed under the assumption that there is a single break point in the data. As with any econometric technique, this procedure can give misleading results when applied to inappropriate data. Suppose that instead of a single break

point, there are two mean shifts: one on day s , and another 20 days later. If the second shift reverses the first, the algorithm described above may very well miss both shifts. The algorithm only chooses events that shift the price for the remainder of the war; the two events will tend to be "averaged," so that neither is located. Even if the two shifts move in the same direction, the algorithm may have trouble *dating* the shift, for the same reason.

To address this problem we look for mean shifts that last for periods of time that are shorter than the rest of the war.¹² Clearly, as the time period gets shorter, it becomes easier for a shift to be characterized as "long lasting." The time period could be made two days—then there would be no worries about confounding the effects of different events. But then we would be back to analyzing blips. In short, there is a trade-off—as the time period of the analysis grows longer, we are more likely to obtain false negatives, that is, miss events that are important; but as the time period grows shorter, we may obtain false positives, that is, characterize events as "long lasting" that really were not. Clearly, some unavoidable arbitrariness is involved in making this trade-off, but our results do not seem sensitive to reasonable changes in the length of the window of time examined.¹³ After some experimentation, we settled on a 50-day period, that is, the change in price after a given date must last at least 50 trading days in order to be deemed long lived. Below we discuss potentially important events that might be missed because of our focus on mean shifts.

Our procedure for finding the turning points is based on Banerjee et al. (1992), and involves the following steps:

¹⁰ Stock-market studies using contemporary data usually include some measure of the performance of the market as a whole as a right-hand side variable. No such index is available on a daily basis for the Civil War period. Stephen J. Brown and Jerold B. Warner (1980) have shown that in at least some situations, methods that do not explicitly adjust for market factors perform no worse than those that do.

¹¹ Anindya Banerjee et al. (1992) derive the asymptotic distribution of a number of test statistics for unit roots and changing coefficients in time-series regressions, including this F statistic. Their results encompass the case of tests for a break in a stationary time series.

¹² An alternative approach would be to look for all the break points simultaneously. Locating five shifts within a 1000-day time series would require estimating 9.9×10^{14} regressions, which is computationally burdensome. Looking for two shifts is computationally feasible, but risks the "averaging problem" discussed above. Nevertheless, to obtain a rough check on our results, we did it. Of the two break points isolated, one corresponds exactly to one of the breaks reported below, and one falls between two others.

¹³ An 80-day period, for example, did not change the basic location of significant break dates.

TABLE 1—MAJOR STRUCTURAL BREAKS AND CORRESPONDING EVENTS

Date (1)	Percentage change in greenback price (2)	Long-run percentage change in price (3)	Major events (4)
September 23, 1862	-0.44	-8.8	Battle of Antietam; formal announcement of Emancipation Proclamation
January 8, 1863	-1.40	-28.0	Ways and Means Committee proposes increasing the supply of Greenbacks by \$300 million
July 6, 1863	1.56	31.2	Battle of Gettysburg; news of Battle of Vicksburg
August 27, 1863	-0.63	-12.6	Unknown
July 12, 1864	4.80	96.0	Early's army retreats; Fessenden confers with New York bankers
August 24, 1864	0.40	8.0	Rumors of Lincoln's agreement to a peace conference
March 8, 1865	2.60	52.0	Unknown

Notes: Column (1) shows break-point dates determined by the algorithm described in the text. Column (2) is the percent change in the conditional mean, based on the estimates of γ_s from equation (1). Column (3) is the long-run change percentage change in the price; in terms of equation (1), it is $\gamma_s (1 - \Sigma\beta_i)$. Column (4) gives a brief explanation for the shift, which is elaborated upon in the text.

- Using data from the 100-day period March 24, 1862 to July 19, 1862, estimate the regression

$$(2) \quad \ln p_t = \beta_0 + \sum_{i=1}^{12} \beta_i \ln p_{t-i} + \varepsilon_i,$$

and calculate the F statistic associated with a test of the hypothesis that the coefficient on an omitted dichotomous variable is zero.¹⁴ (The lag length of 12 days was chosen by using the backward selection procedure suggested by Perron [1989] under the assumption of no break.¹⁵)

- Estimate the regression again, this time using a 100-day "window" that begins one trading day after that used above, that is March 25, 1862 to July 21, 1862. (July 20 was a Sunday.) Repeat the process over and over, each time moving the window over one day, until the entire period of the war has been covered.
- Sequentially search for peaks in the series

of statistics, first picking the maximum and eliminating the window around that date, then searching for the next peak. These are the windows in which the null hypothesis of no breaks is most strongly rejected;¹⁶ they therefore have the greatest likelihood of containing structural breaks.

- Within each of the windows isolated in step 3, test for statistically significant structural breaks by estimating a series of regressions like equation (1).¹⁷ As explained

¹⁶ Critical values for the F test of no break were approximated with 5000 Monte Carlo simulations for the null model $y_t = 0.9y_{t-1} + \varepsilon_t$, with ε_t independently and identically distributed (i.i.d.) $N(0, 1)$, and a length of 1000. (Nonparametric tests of the distribution of deviations from the autoregressive process in the data do not reject normal errors; moreover, fat-tailed error distributions, such as the Cauchy, are rejected by such tests.) The 90-, 95- and 99-percent critical values are 10.1, 11.2 and 13.4, respectively. All F statistics for the break points in these data are greater than 20.

¹⁷ Jushan Bai et al. (1994) report that the width of the confidence interval for a sequential F test for a single structural break (as in step 4) identifying a date decreases with the magnitude of the true mean shift. For a mean shift of 0.75, the 90-percent confidence interval would be about 31 days (that is, plus or minus 15 days). The mean shifts listed in Table 1, however, are relatively large (in absolute value), so that a 90-percent confidence interval would be closer to plus or minus 4 days (based on Bai et al.'s results for a univariate series with a mean shift of 1.5). In the text

¹⁴ There is a correspondence between this F test and the associated Lagrange multiplier test. In essence, this process locates the windows with the highest sum of squared errors, or equivalently, the lowest R^2 .

¹⁵ It would be more appealing but computationally burdensome to allow for varying lag lengths at each possible break point.

above, the date associated with the maximum F statistic is identified as a break point in the series. Note, however, that the sequential break tests cannot identify breaks around the beginning or end of a sample. The usual practice is to trim some fraction of the sample, so that, if there are 100 observations in the sample, the search begins at observation 26 and ends at observation 75. Since our windows are taken from a larger sample, for each window identified in steps (1)–(3), we take a 150-day period, centered on that window as the sample for the sequential test. Then we begin the sequential test on day 26 of the expanded window (day 1 of the original window) and end the search at day 125 of the expanded window (day 100 of the original window).

An Alternative Methodology

An alternative approach to finding key dates is to estimate a regression like equation (2) for the entire war and base the analysis on the cumulative value of the residuals over short periods, for example, two or three days. The logic behind this approach is that the largest cumulative residuals are associated with the biggest surprises, and these must be the most important pieces of news. From a formal point of view, this approach uses a linear combination of the regression errors, as opposed to the approach described above, which uses the sum of squared errors. Thus the Banerjee-Lumsdaine-Stock methodology and the alter-

native methodology based on surprises are similar in spirit.

The problem with this second approach, which forms the basis of conventional event studies, is that it does not lead to an answer to the question in which we are really interested. An event study estimates how an occurrence on a known date (like a battle) affects prices; it does not *identify* which dates market participants view as major turning points. A turning point is a long-lasting change in the market valuation of the asset, and cannot be isolated merely by looking for extraordinarily high residuals. Indeed, when we attempted to implement this approach, it gave discomfiting results. The events isolated were all bunched together closely in 1864 so that, for example, Gettysburg was omitted. When we reestimated the model with a generalized-least-squares (GLS) correction for autoregressive conditional heteroscedasticity the qualitative results did not change.

An alternative approach that would be much closer to ours is to characterize turning points in terms of their impact on the β 's of equation (1), in addition to the intercept. That is, a turning point changes the pattern of the autoregressive process. We investigated this possibility and found that, in practice, we can never reject the null hypothesis that the coefficients on the interactions of D_{st} and the lagged prices are jointly zero.

IV. Results

The first stage of our econometric methodology yields the plot of F statistics exhibited in Figure 4.¹⁸ Two features of this plot are noteworthy. First, most of the local maxima exceed the critical value by a considerable margin. Second, these local maxima are sharp peaks, suggesting that periods in which the autoregressive model fit the data poorly are relatively brief and clearly distinguishable from one another. As noted above, all these maxima need not be break points, because they may not be associated with mean shifts. In fact, our

we discuss only the point estimates, but our examination of the newspapers and historical accounts did not reveal important events within this interval. Our procedure for identifying break points is similar in spirit to that of James D. Hamilton (1989), who proposes a method for estimating whether and when a regime shift may have occurred in time-series data. Hamilton examines the case where the parameters of an autoregressive process are the outcome of a discrete-state Markov process. The number of regimes is assumed to be known. In contrast, we come to our exercise without strong priors about how many "regimes" exist in the data. Therefore, using Hamilton's method would require the computationally burdensome task of searching over the underlying Markov switching processes as well as over the parameters of the autoregressions themselves.

¹⁸ For the sake of completeness, the figure includes the F statistics for the postwar period. See the discussion of the postwar results at the end of this section.

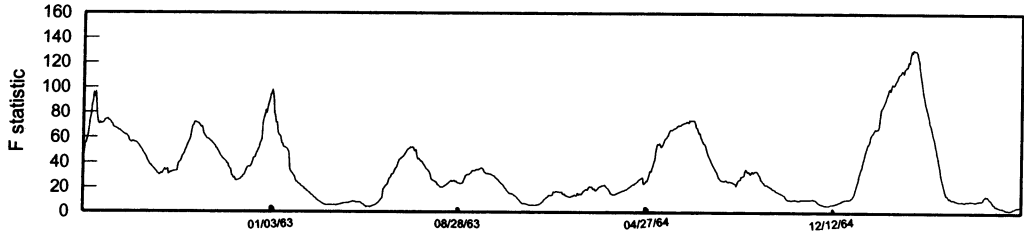


Figure 4(a): 5/12/62 - 8/26/65

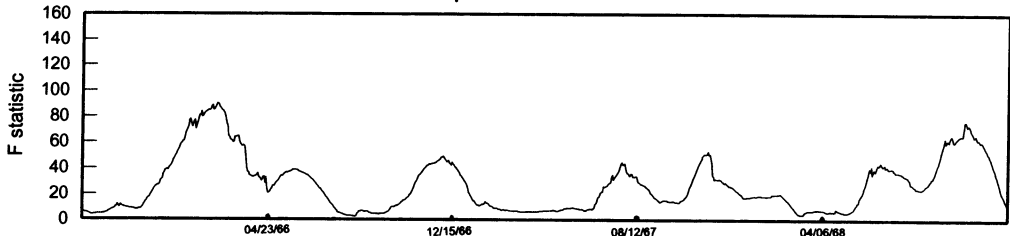


Figure 4(b): 8/28/65 - 11/30/68

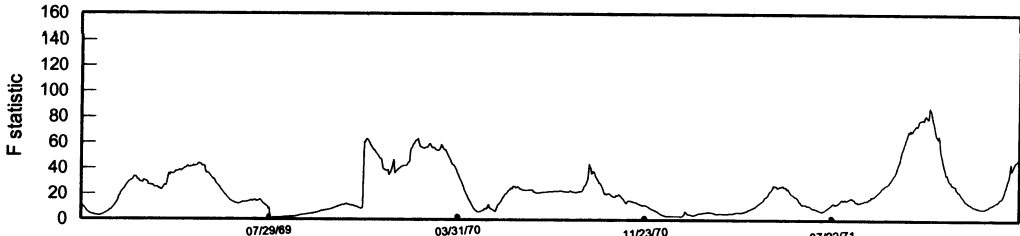


Figure 4(c): 12/1/68 - 3/22/72

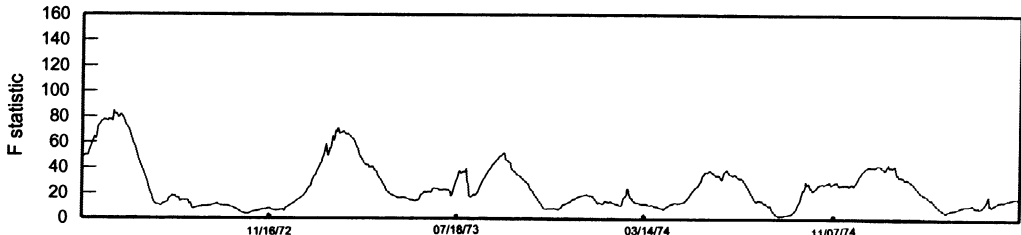


Figure 4(d): 3/23/72 - 7/7/75

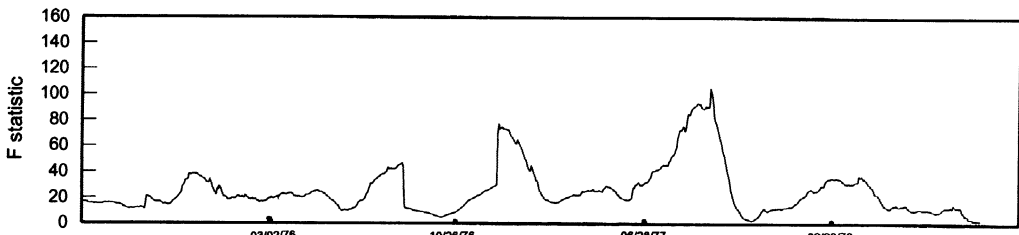


Figure 4(e): 7/8/75 - 9/3/78

FIGURE 4. PLOTS OF F STATISTICS FOR EQUATION (2) FROM 1862 TO 1878

methodology identifies only seven of these dates as being significant breaks in the gold price of Greenbacks. Table 1 lists those turning points, the percent change in the conditional mean price of Greenbacks that occurred on those dates, the long-run impact of that change (that is, the percentage price change we would observe if no other shocks ever occurred), and the major associated events.

The dates listed in Table 1 fall naturally into three groups. The first group is comprised of events, such as the victories at Gettysburg and Vicksburg, that are completely consistent with conventional historical views of the Civil War. In other instances the market reacted strongly to events that have received relatively little stress from historians, but are easy to understand as causes for concern or optimism. Our list also includes two dates for which the market appears to be responding to *something*, but from the historical record we cannot tell what it was.¹⁹ Finally, we discuss two types of events that did not make it onto the table. First are events that historians have suggested were important but which were *not* viewed as turning points by financial markets. Second are events that are associated with a substantial blip (a large one-day change) but were not persistent enough to be identified as mean shifts. We consider each class of event in turn.

A. Well-Known Historical Events

September 23, 1862.—The market reacted *negatively* to two closely spaced events: the battle at Antietam (a costly Union victory) and Lincoln's official promulgation of the Emancipation Proclamation. Why would Antietam be *bad* news for the Greenback? The *New York Herald* (20 September 1862) claimed that "at length, the backbone of the rebellion is broken" (p. 1) and the next day called the battle a "turning point ... tantamount to the collapse of the rebellion" (p. 1). Market participants, however, appear to have agreed with later historians, who viewed Antietam in more sober terms: first, Union General McClellan wasted

a golden opportunity to decimate Lee's Confederate Army; second, the battle itself cost so many lives that it could lead people to revise upward their estimates of the war's future costs.

The more likely cause of the structural break is that the Emancipation Proclamation destroyed any hope for a peaceful settlement to the war. McPherson describes the Emancipation Proclamation as reflecting Lincoln's gradual realization that the war could not be won except by breaking the South and making southern property holders suffer. The actual structure of the proclamation—it would not go into effect until January 1, 1863, and did not take effect at all in the loyal slave states—made the proclamation as much a threat as a concrete measure. At a cabinet meeting on July 22, Lincoln explained his determination to go ahead with the measure, and his cabinet approved (James McPherson, 1988 p. 557).²⁰ The proclamation raised the stakes (or at least clarified the higher stakes Lincoln had long insisted upon) in two ways. First, the Union Army was, in effect, going to free the slaves in conquered areas, essentially destroying the property relations on which southern society had been based. "From now on the North would fight not to preserve the old Union but to destroy it and build a new one on the ashes" (McPherson, p. 489). Second, Lincoln was shifting from his prewar rhetoric of "not disturbing slavery where it existed." Any doubts about his willingness to tolerate slavery in the seceded states, even if they should end the rebellion, would now be over.

The *New York Herald* approved of the measure on the grounds that the South would certainly end the rebellion rather than risk the social upheaval of emancipation (23 September 1862, p. 4). In contrast, market participants did not believe that the proclamation would hasten the war's end. Rather, the Emancipation Proclamation caused people to think in terms of a more "total" war, which would also be a more expensive war.

¹⁹ David Romer (1993) provides a theoretical explanation of how asset prices can move in the absence of external news, even if agents are rational.

²⁰ We are grateful to James McPherson for pointing out to us that Lincoln's cabinet kept this decision secret. The Emancipation Proclamation was a surprise when it was announced.

July 6, 1863.—Gettysburg and Vicksburg were, as noted above, clear and significant military victories for the Union. Historians have argued that, at the time, observers did not view Vicksburg for what it was: the end of Confederate control of the Mississippi, and so the severing of the western from the eastern part of the Confederacy. In contrast, historians have noted that contemporaries clearly understood the significance of Gettysburg. Unfortunately, since news of these two battles reached the east at about the same time, we cannot make any statistical distinctions between market reactions to the two separate events.

B. Less Prominent Historical Events

January 8, 1863.—The day before, a bill approved by the Congressional Ways and Means Committee to increase the supply of Greenbacks by \$300 million was made public.²¹ Using Calomiris' conceptual framework referred to above, the significance of this action is its impact on the public's perception of Union financial conditions. Specifically, participants in financial markets may have viewed this proposal as an admission that the fiscal measures taken to that date—previous Greenback issues, borrowing, and taxes—were insufficient to meet the Union's needs. Thus, the government was acknowledging, however indirectly, that it expected the war to be more expensive than earlier anticipated.

July 12, 1864.—This is the largest shift (in absolute value of the percent change) of the entire war; at 4.8 percent, it dwarfs the next largest, 2.6 percent. The large value reflects good military news. Jubal Early's Army, in a threatened raid on Washington, had approached to within five miles of the White House by July 11, 1864. Until the raid on July 11, it was unclear what Early's objective was;

on July 10, the *Washington Evening Star* published a dispatch from Baltimore: "The excitement in this city is intense and on the increase. Crowds are thronging the bulletin boards, and a thousand wild and improbable rumours are in circulation." Since Grant had withdrawn most of Washington's defenders to aid in the siege of Petersburg, many feared for the safety of the Union capital. On July 12, however—partly in response to the hasty arrival of Union reinforcements—Early decided to break off the raid and return to Virginia. Historians generally view this as a minor footnote to the war. Financial traders, apparently, took Early's threat very seriously indeed.

The July 12 percentage price change is the largest one in the table. This observation raises the question of how relative magnitudes of the percentage price changes should be interpreted. The price changes do not measure the historical importance of an event; rather, they measure the updating of expectations of the future redemption value of Greenbacks. For example, consider the difference between the market's reaction to Gettysburg and to Early's retreat. Gettysburg was certainly more important in the larger historical sense because the Union victory dramatically reduced the chance of a negotiated settlement leading to southern independence. When Early retreated from Washington, it did not really change anyone's perception of the outcome of the war. However, the size of the mean shift associated with Gettysburg is smaller because although it increased traders' probabilities of eventual Union victory, it also increased expected costs of bringing the war to a close. As noted earlier, higher expected war costs would reduce the probability that Greenbacks would be redeemed at par. On the other hand, Early's retreat marked the end of any serious possibility that the Confederacy would be able to bring the war back into the North. That said, it is useful to emphasize that the price changes in the table are *percentage* changes. By the time of Early's retreat, the price of Greenbacks in gold dollars was substantially smaller than it was at the time of Gettysburg. The absolute conditional change in the Greenback price was smaller after Early's retreat than at Gettysburg, but because the base was so much lower, it registers as a larger percentage increase.

²¹ See the *New York Herald* and the *New York Times* for January 7, 1863. The bill that ultimately passed (on March 3, 1863) authorized an expansion of only \$150 million. No actual single increase in the supply of Greenbacks came close to the \$300 million figure proposed on January 8 (see Dewey, 1939 p. 288). There were three issues in all during the war, totaling \$450 million.

There may have been financial news as well. Chase resigned as Treasury Secretary on June 30, 1864. William P. Fessenden, previously the chairman of the Senate Finance committee, was appointed Chase's replacement on July 1. Prior to his appointment as Treasury Secretary, Chase had been a Senator and Governor of Ohio. Both contemporaries and historians have been critical of Chase's financial expertise and his ability to accept advice. Fessenden, in contrast, played the part of financial savior, in no small measure because of his willingness to take the advice of bankers.²² The mean shift on July 12 cannot reflect approval of Fessenden's appointment, since that had been known since July 1. However, Fessenden had a meeting with New York financial leaders just prior to our mean shift; it is possible, although we have no direct evidence on the matter, that either Fessenden's general attitude or some specific decision reached at that meeting caused financial traders to evaluate the Greenback more highly.

August 24, 1864.—News of the only important military event close to this date—the fall of Fort Morgan on August 24, which virtually completed the Union blockade of Confederate ports—could not have caused the price movement, since this would require essentially instantaneous transmission of information, which is implausible. The *New York Times*, in commenting on a rise in Greenback prices on the 24th, advanced what is probably the real reason. Throughout July and August, peace feelers from the Confederacy had put Lincoln (who was also facing reelection) under great pressure to drop his commitment to abolition as a condition for negotiations. The

New York Times (25 August 1863, p. 8) reported rumors to the effect that Lincoln, under the pressure of a reelection campaign against a peace-minded Democrat, planned to change his position. According to McPherson (1988 p. 770), the rumors were not baseless: "Lincoln almost succumbed to demands for the sacrifice of abolition as a stated condition of peace."

C. Structural Breaks Not Associated with Events

August 27, 1863.—Most military news at this time was insignificant, and positive for the Union at that, making it hard to understand the Greenback's depreciation. The sacking of Lawrence, Kansas, by Confederate guerrillas occurred on August 21, but was viewed as minor by the New York newspapers (the *Herald* reported the event on p. 5). The Union siege of Charleston had been under way for some time, and the *Herald* (28 August 1863, p. 2) claimed that the fall in the Greenback price reflected disappointed expectations: "[t]he opinion on the street is partly that gold has been oversold, on expectation about the taking of Charleston..." (Charleston did not actually fall to the Union until February of 1865).

March 8, 1865.—There was virtually no military news at this time. Grant was bogged down in his assault on Petersburg, and Sherman was somewhere in North Carolina—his precise whereabouts, and so his activities, were unknown. Newspaper stories give the impression of being desperate for some real news to report.²³

These mean shifts show that, much like modern financial markets, some movements in

²² Albert S. Bolles (1886), writing not long after the Civil War's end, was scathing in his discussion of Chase, who he described as overly proud, ambitious, narrow-minded, petty, and stubborn. Fessenden, on the other hand, "... had the complete confidence of all. Of the purest private character, devoted to his country, not overconfident of his abilities, and desirous of knowing more, a better choice probably could not have been made. He accepted the office reluctantly, and, though serving as secretary only eight months, rescued the treasury department from the grave disorder into which his predecessor had plunged it" (p. 115–19).

²³ Some Britishers apparently believed that the fall of Richmond was in fact "news" in the sense of this paper. However, the *Economist* (11 March 1865 and 18 March 1865) argued that such observers were overreacting to intemperate remarks by Union politicians to the effect that, after defeating the Confederacy, the Union would invade Canada. As stressed in the quotation by Calomiris above, it is always possible to "explain" a movement in prices ex post. However, in this case, we are inclined to credit the *Economist's* assessment that the fall of Richmond did not signal an invasion of Canada.

Civil War gold prices did not correspond to real news. We find this neither surprising nor puzzling. While one could certainly scour the news accounts for events to “explain” these mean shifts, we think that it makes more sense simply to acknowledge that some long-lived price changes may be inexplicable. Contemporary observers trenchantly made the same observation:

Were William Street [location of the Gold Room] the criterion, we should say that the Northern mind has lost its power of foresight. The doings there are just such as might be expected of men as blind as bats to what may happen next month or next week—of bipeds who have somehow lost the great attribute of humanity, the “large discourse of looking *before* and after.”... The price of gold ought to be primarily determined by the military prospects. But the fact is that it is not so determined to any appreciable extent. Successes achieved have an effect; successes in the course of achievement have none.

—[*New York Times*,
4 July 1864, p. 4]

An alternative possibility is that these two dates are associated with an unusual confluence of events. Consider, for example, the March 8 break point and its relation to the siege of Petersburg. Suppose market participants were frequently updating their assessments of Grant’s eventual success on the basis of news arriving from Petersburg. We already know that our method will not identify a break point if the daily updates are sufficiently small, even if the cumulative effect over a period of months is large. However, during such a period of small updates, noise on a particular date might be mistaken for a structural break.²⁴ To investigate the likelihood of this occurrence, we constructed price series characterized by slow updating and noise, then checked to see how often our methods would detect a break in these data. Depending on the size of the break relative to the noise, our procedure

²⁴ We are grateful to Charles Calomiris for this suggestion.

either located *no* breaks or identified a date within about ten days of the onset of the updating.²⁵ In other words, if a false break point is identified, it will be near the start of the time at which the updating began. Inasmuch as the siege of Petersburg began the previous June, we do not think that the identification of March 8 is a consequence of this phenomenon.

D. *Events Not Viewed as Major News by the Financial Markets*

Table 1 is also noteworthy for the events it does not include. A number of military and political events that are often viewed as turning points did not induce participants in the gold market to revise their expectations about future costs of the war. For example, the Second Battle of Bull Run (August 30, 1862) did not even cause a blip in the price of Greenbacks. Neither did Lincoln’s removal of McClellan from command on November 7, 1862. The overwhelming victory of Union forces at Chattanooga on November 25, 1863 led to a 3.17-percent increase in the price of Greenbacks on November 27 (the next trading day), but this appreciation was almost entirely canceled by negative movements over the next few days. Similarly, after Lincoln’s reelection on November 8, 1864, the price of Greenbacks fell by a few percentage points, but it rebounded two days later.

One also might have guessed that the National Banking Acts would have had an important impact on the Greenback market. The first act, passed on February 25, 1863, declared that any bank which met the specified capital requirements could get a federal charter, establishing “free banking” at the federal level. The notes of such banks were backed by federal bonds and, at some level, these banks were simply markets for federal bonds (Bray Hammond, 1985 p. 727).²⁶ On March 3, 1865, Lincoln signed a bill that taxed state-chartered

²⁵ Specifically, the procedure identifies a break occurring within ten days of the onset of the updating in 87 percent of the trials where any shift is detected.

²⁶ On June 3, 1864, Congress modified the original act with new reserve requirements and some other changes that are minor from our point of view.

bank notes at 10 percent. This measure was intended and viewed as an effort to force all state-chartered banks to adopt federal charters (and thus become markets for federal bonds). Nevertheless, the passage of these acts had no significant impact on the Greenback's price.

Because these events are not even associated with substantial short-term changes, we are confident that participants in the financial markets did not regard them as important news: either the events had no permanent effects on people's expectations or they were fully anticipated and so had already been incorporated into prices. Of course, the assessments of financial market participants and the general population need not be the same. Still, despite the importance these events have been assigned by historians, they apparently did not rate as turning points in contemporaries' estimates of prospects for the war and eventual redemption.

E. Events Viewed as Blips but Not Turning Points

As we stressed earlier, our focus on events with long-lasting effects carries a cost: we may miss some events that would have induced mean shifts had not countervailing movements occurred within a relatively short period of time. To investigate this possibility, we located the five largest single day percentage changes in the Greenback's price (that is, blips) during the war. On June 22, 1864, there was a 7.6-percent drop in the price of Greenbacks. This was two days after the government ordered the Gold Room to close. The Union government viewed speculators with a contempt accurately reflected in the Lincoln comment cited at the beginning of this paper. Market participants may have viewed the Gold Room closure as an act of desperation: the Union government did not want a gold market offering an immediate comment on every move it made.²⁷ If so, the decline in the Green-

back price is entirely understandable. One other large blip occurred during the time the Gold Room was closed (June 27, a 5.9-percent drop) and is probably associated with the fact that the lack of an organized market made prices more volatile. The suppression of the gold market was not a success; the government permitted it to reopen after only about two weeks.

Of the remaining three blips, two occurred within 20 days of each other, on March 5 and March 25, 1863. The March 5 increase of 5.5 percent may have been caused by Congressional passage of the Enrollment Act two days earlier. This act instituted a draft. The March 25 increase of 7.75 percent may have been due to financier Jay Cooke's successful sale of millions of dollars of Union bonds. As noted above, our method for isolating mean shifts can be confounded when two events occur within a short period. While we cannot know for sure that these events were overlooked by the algorithm because of their proximity, it seems a distinct possibility.

The remaining blip was December 19, 1864, when the price increased by 5.75 percent. This may have been due to the disintegration, on December 16, of the Confederate Army of Tennessee, which had been defending Nashville. On the other hand, this Army had been besieged for several days, so it is not clear that the final collapse would have been news. There are no other substantial blips within a month of December 19 that would cause our algorithm to miss this date. Hence, we feel safe in concluding that this was in fact *not* an event that led to a long-lasting reevaluation of prospects for the redemption of the Greenbacks.

F. Some Results from the Postwar Era

As noted earlier, a natural check on our method is to apply it to the postwar data. Therefore, we extended our daily price series to December 31, 1878, and used our procedure to check for break points. Since this is only intended as a check on our method, our discussion of the results is necessarily brief. First,

²⁷ There are other historical episodes in which governments have objected to financial markets implicitly passing judgment on their actions. For example, David Weir (1989) argues that one reason pre-revolutionary French finance ministers preferred life-contingent debt instru-

ments was the difficulty of forming a secondary market for such annuities.

we find only eleven break points in the 156 months of the Greenback's postwar history; in comparison, we found seven break points during the forty months of the Greenback's war-time existence. The relatively low frequency of post-Civil War break points demonstrates that our method does not force break points to occur with any particular frequency.

Without going into great detail, several of the postwar break points are associated with notable political news, such as a Supreme Court judgment against the government in favor of the Union Pacific Railroad or announcements about debt-reduction measures by the federal government. Several other break points are associated with financial crises, attempted gold corners or news regarding gold discoveries or shipments. Finally, as was the case during the war, there are several break points for which the news of the day does not provide a compelling explanation. The fact that such reasonable results are found in the postwar era gives us more confidence in our findings for the war itself.

V. Conclusion

To cover expenses during the Civil War, the Union issued Greenbacks, a legal tender currency that was not immediately convertible into gold. Any event that increased the expected future cost of the war decreased the likelihood that Greenbacks would eventually be redeemed with gold at par. Such events therefore tended to decrease the gold price of Greenbacks, *ceteris paribus*. Hence, the gold price of Greenbacks is a potential source of information on opinions regarding the progress of the war. In this paper, we analyzed daily price quotations to assess how people at the time evaluated military, political, and financial news.

In some respects our results are consistent with conventional accounts: for example, the Battle of Gettysburg was viewed as a major turning point. In other cases, however, we have found that contemporaries gave more weight to certain events than historians generally have. Once such example is Jubal Early's retreat from Washington in July of 1864. Largely downplayed by modern historians, Early's retreat triggered jubilation in the Gold Room. Such findings demonstrate that

the "opinion poll" implicit in financial market prices can lead to new conclusions about how contemporaries viewed events.

More generally, our methodology provides a useful way for studying how people in the past responded to various events that were happening around them. One could, for example, use financial market information from the early twentieth century to gauge reactions to the threats of war and feelers for peace that preceded the outbreak of war in August 1914. Participants in financial markets may not, of course, be "typical" of their contemporaries. But why should the opinions of thousands of people, distilled in market prices and expressed at the risk of their own personal fortunes, be viewed as any less representative than those manifested in the literary sources more commonly used by historians?

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