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Business Activity and the Boston Stock Market, 1835–1869*

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Using annual data, this paper develops new indexes of price performance, dividend yields, and total returns for bank stocks and industrial equities traded on the Boston stock market between 1835 and 1869, a time when it was the nation's premier market for industrials. Using these new series and a set of vector autoregressive models, we conclude that disturbances in the banking sector, as manifested by declines in total returns to bank stockholders, led to increases in short-term lending rates which in turn led to declines in the price performance of traded industrial firms. There is no evidence of feedback from industrial stock returns to bank stock prices via lending rates. The findings are consistent with a key role for banks in 19th-century business fluctuations.

INTRODUCTION

Many studies (e.g., Sylla, 1969; James, 1978; Wachtel and Rousseau, 1995; Rousseau, 1998a; Rousseau and Wachtel, 1998) have presented evidence on the centrality of the American financial sector during the rapid industrialization that occurred in the late 19th century. The deepening and broadening of financial intermediation which occurred then served as a growth-inducing factor by mobilizing accumulated capital, facilitating transactions, and reducing the importance of personal relationships in the provision of finance. Less attention has been focused on the antebellum period, and primarily on the New England region and one type of financial institution: banks.[1] The emphasis on banks is understandable. For example, Davis (1960) finds that commercial banks between 1840 and 1860 made nearly 87% of new loans with durations of 1 to 6 months to a subset of large industrial firms, and 64% of loans with 6- to 12-month durations. Lamor-

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[1] Bodenhorn (1992, 1997) and Sylla (1998) stand out, however, as studies which document the emergence of a national capital market well before the Civil War.

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eaux (1985, 1994) and Dalzell (1987) also investigate the relationship between industrial development in New England and bank lending practices, focusing particularly on the role of personal connections in industrial finance prior to the Civil War. Whereas lending to insiders later came to be viewed as a source of moral hazard, early on it appears to have served as a signal of bank quality to generally uninformed savers while simultaneously reducing the problem of asymmetric information for bank loan officers. Indeed, Lamoreaux proposes that the shift toward more professional, impersonal lending practices after 1870 even suppressed growth of the industrial sector by excluding many small and possibly more innovative firms from bank finance. Capie and Mills (1995) and Capie and Collins (1996) reach a similar conclusion for increasingly conservative British commercial banks after 1880.

Our paper expands the scope of these investigations to the early equity market by examining the behavior of equities traded in Boston before, during, and immediately following the Civil War.[2] Specifically, we use annual data from Joseph G. Martin's (1871) *Seventy-Three Years' History of the Boston Stock Market* for banks and manufacturing firms traded between 1835 and 1869 to construct measures of market performance, which we then relate to business fluctuations. The results suggest that informational frictions between bank directors and most stakeholders allowed the market prices of bank equities to wander considerably from their fundamental values, but that when declines in bank performance were manifested in monetary stringency, the equity market response for largely bank-dependent industrial firms was rapid. The delayed transmission of banking disturbances allows us to highlight the centrality of banks with equity market data.

As current developments in today's emerging financial markets emphasize, the growth and development of stock market trade in debt and equity claims among anonymous buyers is an important indicator of growing financial sophistication. During the period under consideration here, the capitalization of banks and industrial firms listed on the Boston stock market grew at average annual rates of more than 3%. Although modest by the standard of today's emerging markets, this growth was about double the rate of population growth, suggesting considerable capital deepening. It also implies a growing importance of equity markets in the allocation of financial resources. For this reason, we begin by describing the operation of the Boston stock market and the peculiarities of industrial securities at this time. We next discuss the data and methods used to construct measures of overall economic performance of listed firms and present plots of the series. Observed differences between the various series then lead us to investigate the transmission of shocks across sectors with a set of vector autoregressive models. We conclude with a summary and interpretation of our findings.

[2] In this respect, our study is thus the natural complement to work by Snowden (1987, 1990).

THE MARKET FOR EQUITY SECURITIES IN BOSTON

Although the Broker's Board was not formally established in Boston until October 1834, an informal market for equities in Boston had operated back at least to 1798 (Martin, 1871, p. 7). Thus, for example, Martin (who operated a prominent brokerage on State Street through much of our sample period) noted that, in April 1803, subscription lists for the Boston Bank were closed after the sale of more than $3 million in stock to 1157 subscribers and that the stock opened for sale at $110 to $111 (Martin, 1871, p. 9). Mention is made of the dividends paid by industrials beginning with the Boston Manufacturing Company in 1817, but no stock prices are quoted for industrials before 1835, when the Broker's Board became operational (Martin, 1871, p. 66). In that year, Martin lists prices for 16 companies which had been operating for an average of almost 8 years, suggesting that some historical record and information was already available about the companies being traded on the exchange.

Both before and for some time after its formal creation, the market was small (in terms of the number of buyers and sellers) and thin (as measured by the number of securities being traded at any moment in time). We know, for example, that when the Broker's Board was established it had just 13 members and, though it grew to 36 by the mid-1840s and to 75 by the mid-1850s, there were days when not a single industrial security was traded. On the other hand, there were days during the Civil War when business was described as "*enormous*" (Barron and Martin, 1893, unpaginated, emphasis in original). Throughout the period that we consider, however, a significant part of the trading activity occurred away from the formal exchange at public auctions, despite exchange rules enacted in 1848 that required members to conduct nonestate transactions at the Board (Barron and Martin, 1893).[3] The Boston market was thus much like the New York market, which long had an active curb market in industrials before these moved onto the exchange at the end of the century. The volume of off-exchange activity requires us to consider a broad view of the equity market rather than to focus exclusively on the formal exchange.

While thin in terms of trading volume, the Boston stock market was inclusive in that the traded banks and manufacturing firms represented a significant portion of the total capitalization of their respective industries in Massachusetts. For example, the aggregate capital of banking firms traded in Boston averaged nearly 56% of state banking capital between 1835 and 1862, rising from 48% of $30.4 million in 1835 to a peak of 64.5% of $38.3 million in 1851 before falling to 58%

[3] For example, a detailed analysis of equity trades reported by the *Boston Daily Advertiser* in 1845 revealed that among the 6040 shares of bank stock that changed hands, only 1534 (25.4%) were transacted at the Broker's Board, with the remainder traded at auctions conducted by S. Brown and P. P. F. DeGrand (the founder of the Broker's Board). Interestingly, 121 (37.7%) of the 321 separate transactions that made up total trading in bank stocks in that year were conducted at the Broker's Board, which suggests that off-exchange auctions were used to move larger blocks. Conversely, of the 1867 industrial shares that changed hands, 51% were traded at the Broker's Board and accounted for 43% of the 212 separate transactions.

of $67.5 million by 1862 (U.S. Comptroller of the Currency, 1876, pp. 96–102). For manufacturing, the aggregate capital of traded firms was 42.4% of the $88.9 million (United States Census Office, 1859, p. 143) in statewide industrial capital in 1850 and 35.9% of the $132.8 million (U.S. Bureau of the Census, 1865, p. 251) in 1860.

The thinness and narrowness of the market inevitably raise questions about the prices that emerged. We address this issue in some detail later. For now, we simply observe that Martin himself cautioned that the market for industrials, in particular, was

> an ‘‘exclusive’’ one; for it is almost exclusively in the hands of certain capitalists, who have no desire to sell when it is up, and can afford to hold when it is down. It seldom finds its way to market . . . is the most variable stock of the lists and exceedingly difficult to obtain reliable quotations of. (Martin, 1871, p. 64)

This caveat notwithstanding, the organization of the market minimized the impact of these defects upon prices. Specifically, the exchange operated as a ‘‘call’’ market during this period, in the manner of the Frankfurt and Zurich exchanges today. That is, each security was traded sequentially in each of the twice-daily sessions. The advantage of this over the nowadays more common continuous markets (where any security can be traded any time the exchange is open) is that the full attention and liquidity of the market could be focused on each security eligible to be traded on the market, albeit for only two brief moments of time each day. This ought to lead to efficient prices (see, for example, Cason, 1992; Satterthwaite and Williams, 1989).

The thinness of the securities market may be explained by both supply and demand factors. For example, even though Massachusetts was a leading industrial state and a pioneer in progressive legislation with respect to corporate charters (Dodd, 1948, 1954), fewer than 5% of Massachusetts manufacturing firms before the Civil War were organized as corporations (Atack and Bateman, unpublished census estimates) and thus issued securities. Fewer still were publicly traded. There was, however, little need to raise money in this way so long as firm capitalization remained small—which it did while technology remained simple and markets were limited by high transport costs and a widely dispersed population. The supply of manufacturing equities was further limited by the universal attachment of high par values to those equities that were issued. Most had a par value of $1000 compared with the nominal $1 par values today. Of the 16 industrials traded in 1835, for example, 13 had par values of $1000, 1 had a par of $750, and 2 had pars of $500 (Martin, 1871, p. 64). The high par values may have discouraged high rates of speculative turnover but were also associated with the relatively high cost of maintaining transfer books. Par values on stocks issued later were sometimes lower—shares in the Androscoggin Mills chartered in 1861 (failed in 1870), for example, had a par value of $100, while the Portsmouth Steam Mills (failed in 1865) had a par of just $50. Moreover, some companies (for example, Atlantic Cotton Mills and the Boston and Sandwich Glass Co.) occasionally lowered their initial par values (Martin, 1871, pp. 70–73).

Various institutional factors also limited the demand for equities, particularly early on. Aside from the obvious wealth constraint imposed by the high par values at a time when annual per capita income was between $100 and $200 per year, demand was limited by the real or imagined illiquidity of stock and the potential financial obligations attached to many shares regardless of whether the capital had not been fully paid. Where the full par value of the shares had not been paid in (because, for example, the firm had opted to invest less than its authorized capital or had sought an inflated authorized capital to provide for further growth without having to modify its charter), stockholders, unlike today, were potentially liable for the full par value of their shares under the ‘‘trust fund’’ doctrine enunciated by Justice Story in *Wood* v. *Drummer* (1824), which held that a firm’s full stated capital must be available to satisfy creditor claims. Moreover, the monies required to raise paid-in capital to par were callable by a company at any time. More importantly, stockholders in Massachusetts companies initially had unlimited liability for the debts of the companies whose stock they owned. Indeed, such obligations might extend beyond the time of one’s ownership of the stock. For example, in 1818 and again in 1822 the Massachusetts legislature adopted provisions that held the shareholders of record when a debt was incurred liable for the debt (Dodd, 1948, p. 1365). By the time the Broker’s Board was established, however, Massachusetts industrial stockholders finally enjoyed limited liability protection, beginning in 1830 via special charters and then continuing under the General Incorporation Act of 1851 (Dodd, 1948, especially pp. 1372–1373).

From the first, the Broker’s Board traded a full range of securities, both debt and equity, including federal, state, and municipal debt and railroad bonds as well as equity stock issued by banks, insurance companies, utilities, mining companies, and manufacturing corporations. Except for federal government obligations and a few other issues, notably Lake Superior copper mines, however, most securities tended to be local or regional in origin. This was particularly true of manufacturing, bank, and insurance stocks, and may have served to minimize informational asymmetries in an age before generally accepted accounting practices, outside auditors, and disclosure laws (Baskin, 1988).

As a financial market, the Boston stock market was less important than the New York Stock Exchange throughout the period, but it was the premier U.S. market for industrials until the 1890s, when it was finally surpassed by New York. For example, as late as 1898 only 20 industrials were officially listed on the New York Stock Exchange, although there was a large and rapidly growing trade in unlisted industrials after about 1885 (Snowden, 1987, 1990). In contrast, price quotations were available for 48 industrials on the Boston exchange in 1869 (Martin, 1871, p. 68).

THE PERFORMANCE OF TRADED BANKS AND INDUSTRIAL FIRMS

Martin’s history of the Boston stock market (1871) contains a set of detailed tables with firm-level records of high and low price quotes, par values, and dividends in each calendar year for traded manufacturing firms, banks, insurance companies, and railroads. Moreover, notes accompanying these tables contain additional information on stock dividends, stockholder assessments, splits, and capitalization levels. We use these data to compute summary indexes of annual price performance, dividend yields, and total returns (including both dividends and capital gains) for banking and manufacturing firms weighted both equally and by the book value of each firm's capitalization.

We have already mentioned Martin's cautionary comments regarding the thinness of the market in industrials. These, however, fail to convey a sense of just how thin the market was. We had presumed that stocks would have traded relatively frequently—certainly every few days—even if the numbers traded were small. This proved not to be the case. When trades did take place, few shares from even fewer firms changed hands.[4] For example, on July 3, 1845, the only industrials traded on the board were three shares of the Lawrence Manufacturing Company, which traded at 93% of par (*Boston Evening Transcript*, July 3, 1845), and no indication is given (for this or any other trade) as to whether this was the sale or purchase price. Similarly, on June 3, 1852, one share of Bay State Mills traded at 867½ (*Boston Statesman*, June 5, 1852). This pattern of small and infrequent trades was not atypical and seems to have persisted for many years.

Some industrials were inactive for long periods. In 1854, for example, Martin (whose comprehensive year-end summary of equity trades in the Boston market was published in the January 10, 1855 edition of the *Boston Daily Advertiser*) reports that while 41 industrials were quoted at the Broker's Board and 2327 shares changed hands in that market during the year, no trades were recorded for the stock in 18 of these companies, and in 3 companies (Atlantic, Boott, and Tremont Mills) just 1 share in each was traded during the course of the year. Our own analysis of all issues of the *Boston Daily Advertiser* in 1854 uncovered off-exchange trades of 702 additional industrial shares, including 11 of the issues that were inactive at the Broker's Board.[5] Even the sparsely traded firms saw 46 shares change hands at auction. Fortunately, Martin, who collected the results of the major auctions for weekly publication in the *Advertiser,* included off-exchange activity when reporting the annual course of prices. The most actively traded stock at the Board during the year was the Lawrence Machine Shop, in

[4] We began by examining the *Boston Daily Advertiser,* which from the start of our study in 1835 until September 7, 1844, offered the most comprehensive reporting of equity trades among all of the local newspapers that we have located. This newspaper only included sales of stocks (seldom with price included) that took place at selected auctions. Board sales were not reported. This practice was also followed in the *Boston Evening Transcript* and the *Boston Statesman.* The deficiencies in the historical record during the first decade of the Broker's Board's existence become somewhat less severe after 1844. For example, detailed analyses of listings in the *Boston Daily Advertiser* in 1845 and 1850, as well as spot checks of random dates between 1845 and 1854 from this and the other Boston newspapers, indicate that bank stocks traded relatively frequently, yet there were still many days on which no industrials at all were traded on the Broker's Board.

[5] We know this count to be incomplete in that it includes only the auctions of N. Thompson and S. Brown, omitting the results of regular auctions by dealers Dupee and Perkins, Hayward and Dorr, and Brewster, Sweet and Co., which went unreported in the press.

which 1643 shares (of the 20,000 par-value $50 shares in the company) changed hands, or about 8% of outstanding stock, at prices ranging between $13 and $28.75 per share (*Boston Daily Advertiser,* January 8, 1855).

Upon our encounter of such sparse quotes, our first thought was that our primary source of higher frequency data, the *Boston Daily Advertiser,* was just recording the trades made at the Broker's Board by one particular broker. Cross-checking listings in other sources such as the *Boston Evening Transcript* and the *Boston Statesman,* however, produced the same quotations for the same dates. These other newspapers also indicated that many trades took place outside the exchange.

More detailed information is available on bank stock trades compared with trades of industrials in the *Boston Daily Advertiser* after 1844.[6] As a check on the reliability of Martin's summary price quotes, we compared Martin's high and low prices in 1845 with those obtained over the course of the year from individual editions of this newspaper. Of the 23 banks for which both Martin and the *Advertiser* reported prices, the annual highs matched in 21 cases and were within $2 (with par $100) in the remaining cases. There were 16 matches among the low prices and 6 others within $2. Among the low prices that did not match, those recorded by Martin were lower. These findings suggest that Martin's quotations for bank stocks were quite accurate and perhaps more comprehensive than those available in contemporary newspapers.[7] This favorable assessment of Martin's banking quotes boosts our confidence in the reliability of his quotes for industrials.[8]

Based on our survey of market listings, we are now convinced that the annual high and low prices of both bank stocks and industrials reported by Martin constitute the most inclusive and consistent compilation of activity in the Boston

[6] Railroad stocks and bonds, mining shares, land companies, and insurance stocks also traded more frequently. Thus, for example, at the first board on April 19, 1849, 50 shares of the Vermont Central Railroad were traded at 54¾ and another 37 shares at 55. During the afternoon session, a further 26 shares changed hands, again at 55 (*Boston Statesman,* April 21, 1849). These quotes incidentally suggest that the call market in Boston operated somewhat differently from call markets today, in which the market determines a single price for all shares in a particular stock being traded on a particular board.

[7] It is more difficult to verify Martin's bank quotes before 1844. Nevertheless, the auction prices for 29 banks on January 2, 1836, that were reported by dealer and auctioneer S. Brown in the January 4, 1836 edition of the *Boston Daily Advertiser* all lie between Martin's high and low prices for 1836. We were unable to find other comprehensive listings of this type prior to 1844 in the *Boston Daily Advertiser.* An examination of all issues of *Hunt's Merchants' Magazine* between 1840 and 1860, however, uncovered an article by J. Chickering (May 1842, pp. 465–468) that quoted prices on 25 bank stocks at the end of August in both 1838 and 1842. Only two of the prices in each year fell outside of Martin's range, and none of the cases differed by more than 2% of par. Inaccuracies in Chickering's article (noted by the editor of *Hunt's Merchants' Magazine*) suggest that typographical and reporting errors might explain these small differences.

[8] We did not expect Martin's prices for industrials to match those reported in newspapers as precisely as his prices for banks because of their lower trading volumes and incomplete reporting in the press. Nevertheless, of the 10 industrial firms that had more than seven transactions reported in 1845 editions of the *Boston Daily Advertiser,* annual highs and lows matched in half of these cases. Differences for three of the remaining cases were within 2% of par. While these are not as strikingly similar as the findings for bank stock prices, we submit these results as further support for our belief that Martin's industrial quotes were both reliable and comprehensive.

stock market covering the full 1835–1869 period. Indeed, these reports even achieved a degree of official recognition.[9] Consequently, we use Martin's annual highs and lows as the principal data set in this study to ensure use of consistent data and to analyze the deficiencies in the earlier data (or perhaps their overstatement) most convincingly. Martin also published on an annual basis supporting worksheets with quarterly stock prices and semiannual dividends starting in 1854, and we have used these more precisely sampled data to replicate our empirical analysis over a more limited 1854–1869 time period.[10]

Figures 1a and 1b show the years for which either a price or a dividend is available for each bank or manufacturing equity that was traded on the Boston exchange over the 1835–1869 period. They thus define the universe of our study. The number of manufacturing firms increased rapidly from 21 to 46 between 1835 and 1854 and then rose gradually to 51 by 1865. The banking series included 29 banks in 1835. This number fell to 24 in the wake of the 1837 banking crisis before gradually rising to 49 between 1845 and 1869. Graphs of indexes based on these data and some discussion of their construction follow—the actual series are presented in the Appendix.

We are not the first scholars to make use of Martin's data. In particular, Fenstermaker *et al.* (1988) have used Martin's annual highs and lows on bank stocks to compute weighted averages of annual dividend yields, price appreciations, and holding period returns much as we do. So far as we are aware, however, others have not used Martin's data on industrials.

Dividends

Equity holders, then as now, were entitled to an equal proportionate share of a firm's distributed profits. In this section, we present measures of income performance of traded banking and manufacturing equities based upon these distributions. The dividend yields use two different weighting schemes: in one, firms are weighted equally; in the other, they are weighted by their contributions to total sector capitalization. Dividends are defined to include regular and extra dividends paid in cash as well as stock dividends. Assessments are treated as negative dividends. To be included in the equally weighted series in a given year, a firm must have either a current or a previous dividend declaration, a par value, and a price. Since all firms that declared dividends also had entries for the book value of equity, the equal- and capital-weighted series contain the same number of firms for banks and industrials.

Martin's reporting of only the high and low share prices realized in each calendar year places serious limitations on the precision of our dividend yields. In

[9] After 1856, Martin's annual summaries were deposited by act of Congress in the Clerk's Office of the District Court of the District of Massachusetts and later at the Library of Congress.

[10] Rousseau (1998b) uncovers and analyzes stock prices and returns from this unique data source in a study of the effects of increasing stock market liquidity in Boston on the industrial growth of the New England region from 1854 until the turn of the century.

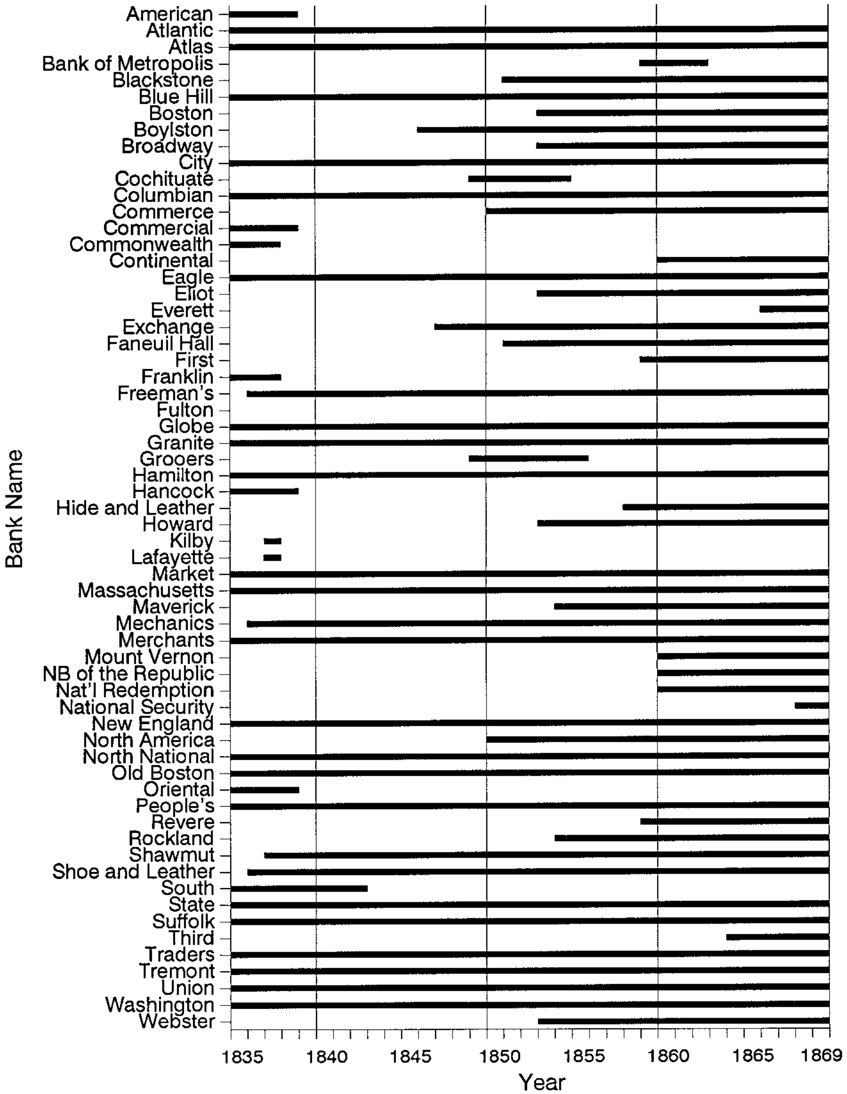

FIG. 1a. Annual price/dividend coverage of Martin's data for traded bank stocks.

an ideal world, an annual (but not necessarily calendar-year) dividend yield for an individual firm would use an ex-dividend price as the base. Even then, an aggregate yield would reflect a precise holding period only if all firms distributed dividends on the same date.[11] Although Martin does not generally flag annual low

[11] For the most part, bank dividends were declared on April 1 and October 1 over the period of our study. The timing of dividends for industrials varied considerably across firms.

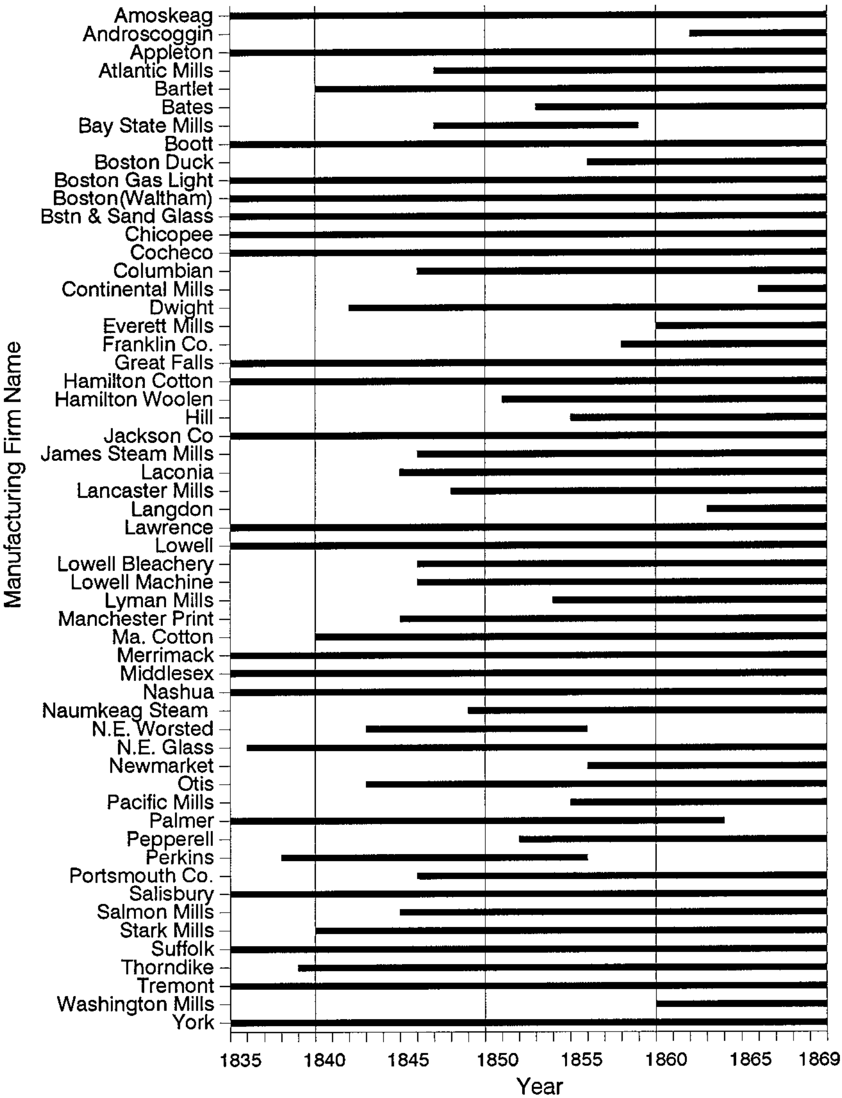

FIG. 1b. Annual price/dividend coverage of Martin's data for traded manufacturing stocks.

prices as ex-dividend valuations, they are more likely to be ex-dividend than high prices. Therefore, we have chosen low prices as the base for the dividend yields rather than either high prices or averages of high and low prices. This choice generates optimistic estimates of true dividend yields, but we bound this optimism by also computing yields under the assumption that annual high prices were realized immediately prior to the payment of a dividend. This involves computing

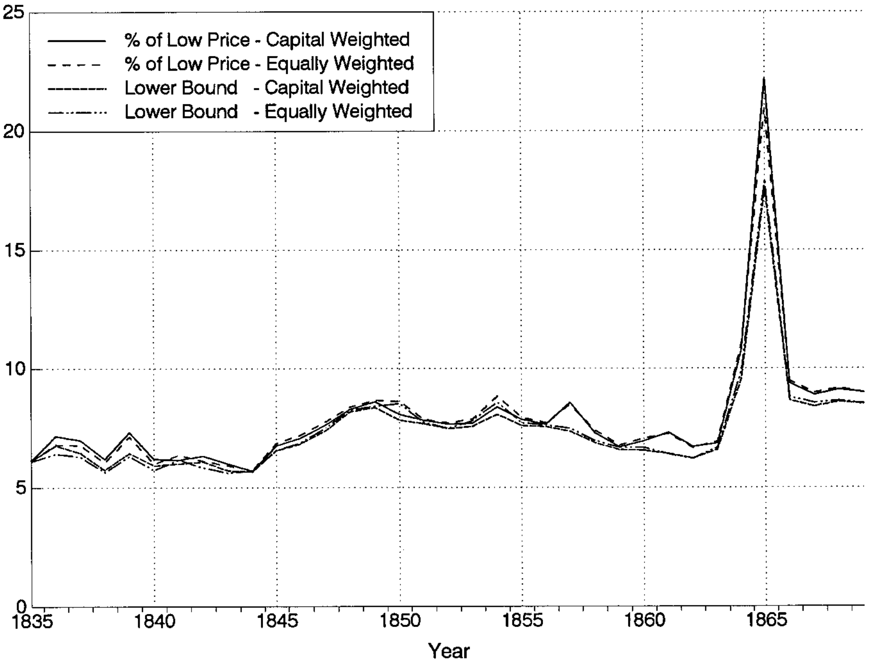

FIG. 2a. Banking dividend yields.

yields with the high price less the largest single dividend payment of the year as the base.[12]

The equal- and capital-weighted dividend yields for banks (Fig. 2a) suggest a fairly smooth dividend policy over the first 30 years of the sample, with yields ranging between 6 and 8%. A large spike in 1865 coincides with very large extra dividends in both stock and cash which accompanied the general reorganization of banks under the newly formed National Banking System (Martin, 1871, p. 53).[13] In fact, 13 banks declared dividends in excess of 25% of par in 1865, with the Suffolk bank even declaring an extra dividend of 128% on January 10![14] Using the capital-weighted series with low prices as the base, sample dividend

[12] We also compute dividends as a percentage of par and list the resulting series in the Appendix. On average, these par-value dividends include seven additional manufacturing firms that declared dividends but for which prices are unavailable. There is little discrepancy for banks in the coverage of par-value dividends and dividend yields.

[13] Given the alleged unattractiveness of national charters that ultimately led to the passage of a 10% tax on state bank notes in a (successful) congressional effort to force conversion, these extraordinary dividends declared by Boston banks upon their adoption of national charters are puzzling. However, we suspect that the paradox might be explained by a decision by banks to use their reluctant conversion from state charters to national ones as an opportunity to adjust their capital to the new (and more restrictive) banking market.

[14] We note too that this was an inflationary period (although the inflation was ending by 1865). We return to this point later.

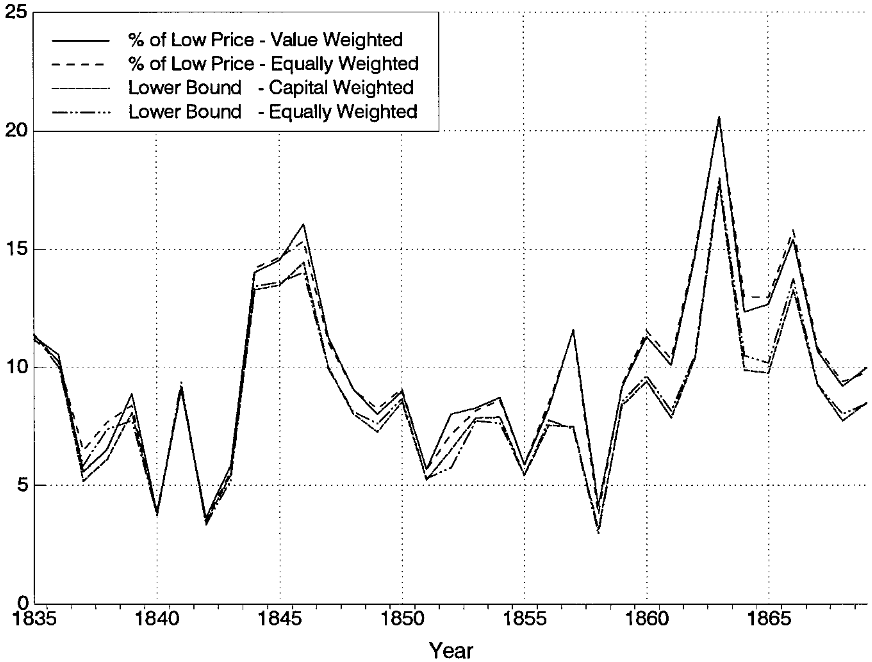

FIG. 2b. Manufacturing dividend yields.

yields averaged 7.92%, with a standard deviation of 2.69%. With 1865 eliminated, these statistics fall to 7.50% and 1.12%. Even after adjustment for inflation, the yields (for the full sample) remain substantial at 7.58% if the price index from the Bureau of Labor Statistics (BLS) is used and at 7% if the Brady, David, and Solar (BDS) index of consumer prices is used.[15,16] The corresponding real standard deviations of 8.05% and 8.06% in our sample exceed those for the nominal yield, however. These differences may reflect price unpredictability over our period and an apparent desire by banks to smooth nominal distributions.

Dividend yields for manufacturing firms increased sharply to about 15% between 1843 and 1846 in the recovery from the 1837–1843 depression (Fig. 2b) before settling back to around 7% throughout the 1850s. They then rose substantially after 1862 in both real and nominal terms. Over the entire period, the mean dividend yield of 9.82% and the standard deviation of 3.69% for the capital-weighted series using low prices as the base are considerably larger than those for

[15] The BLS prices (U.S. Bureau of the Census, 1975, series E135) represent ‘‘retail prices of goods and services bought by city wage earners and clerical workers.’’ Since the BDS prices (David and Solar, 1977, p. 16) are based on account books of Massachusetts and Pennsylvania storekeepers as well as prices paid by Vermont farmers before 1852, they may reflect New England prices over 1835–1851 more precisely than the BLS series.

[16] Here and elsewhere in the paper, we compute real returns as $1 + RR = (1 + NR)/(1 + i)$, where RR is a real return, NR is a nominal return, and i is the inflation rate.

banks, yet the price-adjusted variability is actually less for manufacturing firms.[17] There is little variation between the equal- and capital-weighted series.[18]

As expected, the yields computed with low prices lie above their respective lower bounds, yet differences associated with the choice of base are small.[19] Combined with our finding that the sample distributions of low price dividend yields for individual stocks do not have thicker right tails than those of the lower bounds, this is evidence that annual low prices did not generally arise from transactions during periods of sharp price breaks.[20] It further justifies our use of low prices to produce the most meaningful dividend yields that are possible given the limitations of our data.

The plots also indicate that dividends were an important means of distributing earnings and probably played a key role in keeping prices close to par for both banks and manufacturing firms. Given the agency problems arising from informational asymmetries generally associated with 19th-century equity markets (Baskin, 1988), these income distributions probably served to encourage investors to maintain their equity positions by sending a signal that a particular firm was under sound management. Nevertheless, the variability that we find in the manufacturing dividends, when combined with prices that show relatively little short-term movement but clear trending behavior (Fig. 3b), contrasts sharply with what appears to be a widely held belief that mid-19th-century U.S. investors valued

[17] In real terms, the mean and standard deviation of the manufacturing dividends are 9.35% and 7.04% using the BLS price index and 8.75% and 6.74% using BDS prices.

[18] This is not the case for par-value dividends, in which the equally weighted dividends for manufacturing firms generally exceed the capital-weighted ones. This result is consistent with profit estimates by Bateman and Weiss (1981); Atack *et al.* (1982); and Atack and Bateman (1992, 1994), which indicate that larger firms earned lower returns on capital than smaller firms, though the variance of larger firms was also much smaller. These authors also find that larger firms tended to adjust par to reflect share value more frequently than smaller firms. This may explain why differences in the par dividends of large and small firms apparently vanish for dividend yields. We also note that the mean and standard deviation of the capital-weighted par dividends are 7.56% and 3.03% for banks and 9.15% and 4.06% for industrials. Each average is smaller and more variable than the corresponding dividend yields, which suggests that changes in prices that were below par on average often varied directly with dividends to produce smoother yields.

[19] The lower bound series for value-weighted manufacturing firms marginally exceeds that computed with low prices in 1835. We attribute this exception to market thinness. The two weighting schemes and choices for the base also generate series that are highly correlated. For example, the value-weighted and equally weighted series with low prices have correlations of 0.996 and 0.995 for banks and industrials, respectively. Further, the value-weighted series with low prices have correlations of 0.982 and 0.959 with their lower bounds for banks and industrials.

[20] We examined the sample distributions of dividend yields for individual stocks under the two choices for the base, focusing on firms for which 15 or more annual observations were available. Of the 36 banks which met this criterion, the dividend yields computed with low prices exhibited positive skewness at the 5% level or less in 8 cases, while 14 cases showed evidence of kurtosis. The lower bound series produced the same results for skewness, while kurtosis was removed in 1 case and introduced in another. Among the 36 manufacturing firms with 15 or more observations, the dividend yields of 18 were positively skewed while 12 had thick tails with low prices as the base. The lower bounds eliminated kurtosis in 2 cases but introduced it to an additional 4.

equity securities principally for their dividend streams and that the stability of these streams coupled with fixed par values led equities to function essentially like bonds (Baskin, 1988, 231–232; Graham and Dodd, 1934, p. 342).

Price Indexes

Modern indexes of stock market price performance vary considerably in construction. For example, the Dow Jones Industrial Average is based on the average price of 30 industrial equities after adjustment for splits and changes in the firms that make up the index. If the included firms were to remain constant, this ‘‘price-weighted’’ index would track the accumulated price appreciation of a portfolio consisting of one share of each stock on the day of the index’s creation. A second method, employed by the Value Line Corporation’s Composite Index, computes the average daily percentage change in the prices of the constituent stocks and uses this average to adjust the index value from the previous day, thereby creating a ‘‘chain’’ of index numbers. This index reflects the accumulated price appreciation obtained by an investor who adjusts a portfolio daily to place an equal amount of funds in each stock. Standard and Poor’s 500 index, on the other hand, is based on the total market value (price multiplied by number of outstanding shares) of 500 firms listed on the major U.S. exchanges.

Holding the number of firms in an index constant would require a set of rules for listing and delisting, while an index restricted to the few firms for which we have a complete run of data would be quite unrepresentative. Consequently, the types of indexes that we can construct are limited to those of the ‘‘chained’’ variety (such as Value Line). For each year we compute the average percentage change in prices across all firms with consecutive observations, weighting firms both equally and by book capitalization. Each index number in the chain is then the product of the previous index number (with 1835 = 100) and the average price appreciation for the current year. These indexes have the advantage of easily permitting the number of included firms to shrink or expand with market conditions.[21]

As noted earlier, a low price in any calendar year is more likely to reflect an ex-dividend valuation than a high price, and as such should best capture capital gains for diversified shareholders. Nevertheless, for completeness we have used both low and high prices to construct separate indexes of market performance.[22]

[21] Our indexes resemble those prepared by Alfred Cowles in his 1938 study of the New York Stock Exchange insofar as both compound successive price appreciations. Cowles, however, used more frequently sampled data and compounded percentage changes in the total market value of all outstanding shares of listed firms, keeping the number of shares constant across each calculation in the chain. This method treats firms that become delisted with no further information as total losses (see Cowles *et al.*, 1938, pp. 8–10) and thus induces a downward bias in the resulting index.

[22] Our price indexes differ in several key respects from those computed for the New York market by Snowden (1990), who used Cowles’ *monthly averages* of high and low prices to construct *quarterly* price appreciations. Snowden’s methodology reduces distortions due to variations in the length and synchronization of the holding periods of the constituent stocks, but also produces excessively

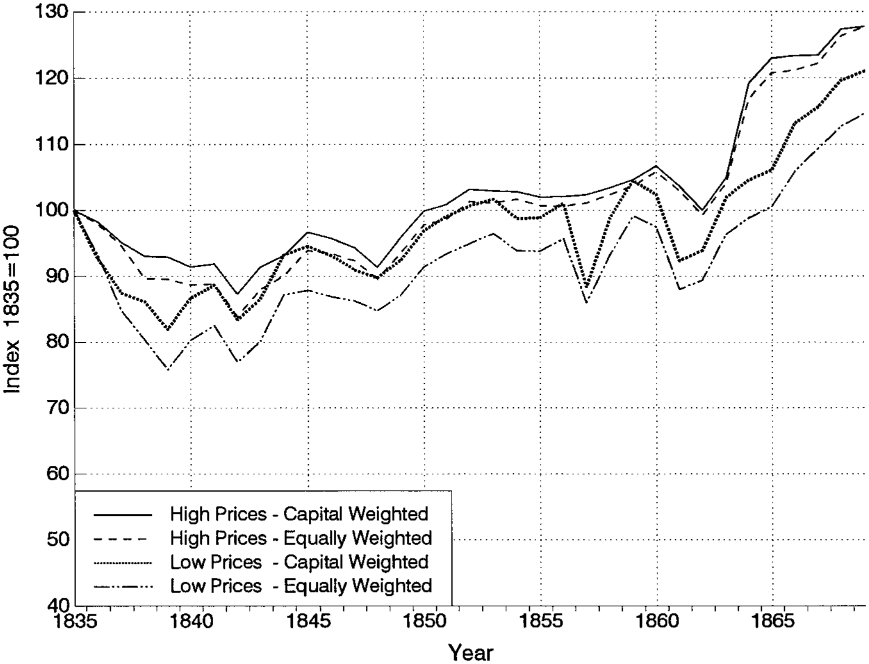

FIG. 3a. ''Value-Line''-type price indexes for traded bank stocks.

We adjust for splits by compensating for the accompanying fall in price. For example, in the case of a two-for-one split, we simply double the price in the year of the split and all subsequent years. In order to be included in the capital-weighted index for a given year, a stock must have both a price and book capitalization, whereas only a price is needed for inclusion in the equally weighted index. These criteria exclude a small number of manufacturing firms for which only dividends are available, especially in earlier years.

Figures 3a and 3b present the price indexes for the banking and manufacturing sectors. While only 16 manufacturing firms have price data available in 1835, this number increases gradually (with the exception of a sharp increase in 1845) to

smoothed returns, especially during periods of high price variability. To assess the severity of these distortions, we used Snowden's procedure to compute price appreciations for individual stocks over 3-year periods and then compounded over four periods to produce three long-term appreciations from our sample (1835–1846, 1847–1858, 1859–1869). We then compared the results with those obtained by directly compounding annual price appreciations over the same time periods. For capital-weighted bank stocks, the annually compounded appreciations never differed by more than 0.5 percentage points from those constructed with Snowden's technique. For capital-weighted industrials, the depreciations diverged by up to 2 percentage points over 1835–1846, 8 percentage points over 1847–1858, and 1 percentage point for 1859–1869. Given the high volatility of stock prices from 1847–1858, the smaller depreciations produced by Snowden's technique may be a result of its smoothing tendency.

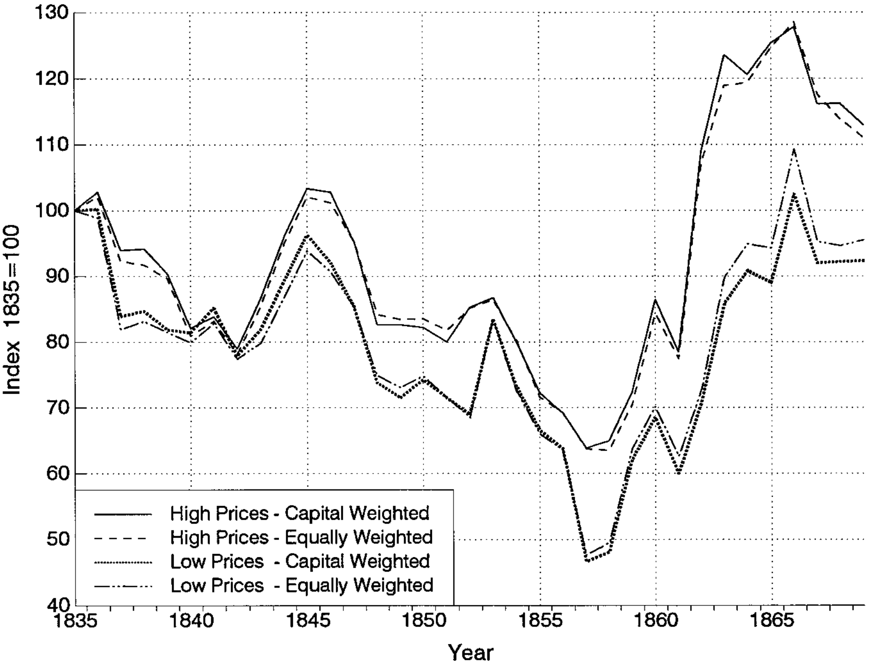

FIG. 3b. "Value-Line"-type indexes for traded manufacturing stocks.

reach a plateau of 48 by 1866. The banking index begins with 27 firms. The downturn that began in 1837 reduced the number to 24 by 1842. Thereafter, coverage increases rapidly to reach a total of 48 banks by 1869. Since a small number of firms have only a low price available in the first year of listing, the high-price indexes include slightly fewer firms in some years.

There is little discrepancy between the capital-weighted and equally weighted indexes for industrial stocks, and the series using low prices exhibit fluctuations that are quite similar to those of indexes constructed with high prices prior to 1860. The largest differences occur in 1863 and could reflect the consequences of heavy and possibly speculative trading in the midst of the Civil War. The time patterns of the low- and high-price indexes also differ markedly over the 1860s. In the banking sector, the high-price indexes tend to smooth the effects of negative shocks in 1839 and 1857 that clearly appear in the low-price series. In addition, the capital-weighted series diverge from the equally weighted series early in the sample, suggesting that smaller banks were hardest hit by the business downturn of 1837–1839.

Sample means and standard deviations for the spread between high and low prices for banks and manufacturing firms in each year are shown in Fig. 4. With the exception of those of manufacturing firms in the 1860s, the standard deviations are relatively stable through time and thus support the notion that annual lows did not generally occur during brief periods of sharp and general

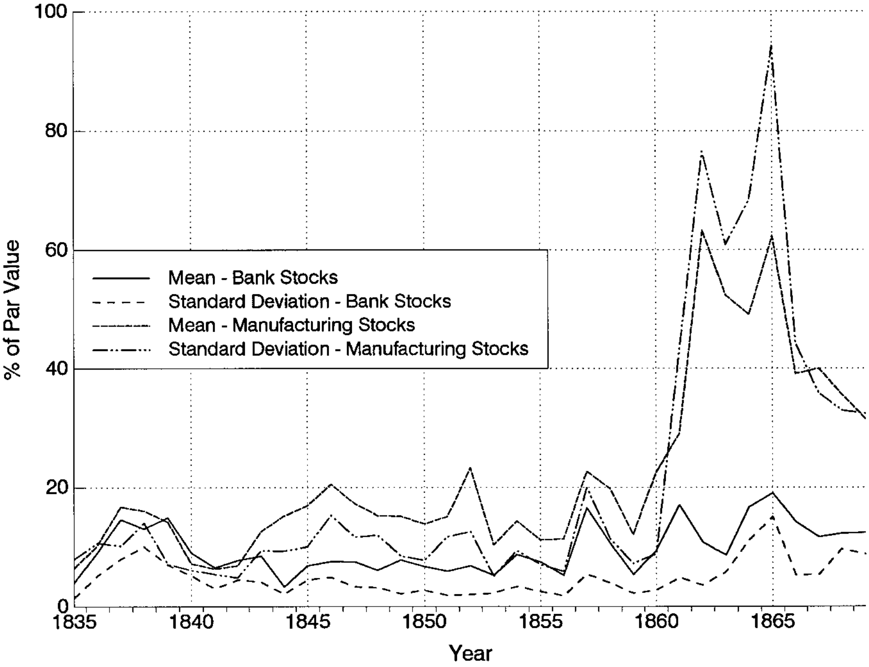

FIG. 4. Annual high and low price spreads.

declines in prices.[23] We also note that the low-price indexes usually lie below those constructed with high prices. If spreads between high and low prices did not gradually diverge over time, one might expect to see high- and low-price series that cross frequently; instead, these spreads appear to widen very gradually over time for industrials. For example, the mean spread was 11.2% of par for 1835–1844, 16.2% of par for 1845–1854, and 29.3% of par for 1855–1864. We also observe that during the first decade, when spreads were smallest, the high and low indexes crossed on two occasions. The divergence of the high- and low-price indexes for banks, on the other hand, reflects an unusually low spread of 3.9% of par in 1835 and larger subsequent spreads (which average 12.1% of par over the next 5 years and 9.4% of par over the remainder of the sample).

The index for capital-weighted bank stocks using low prices enjoyed a mean annual increase of 0.70%, with a standard deviation of 5.10%, over the full time period, rising steadily after 1840. The price gains were usually even larger in real terms.[24] When these data are coupled with dividend data that exhibit peaks and

[23] Given that the available quarterly data indicate continuous price appreciation for manufacturing firms from 1862 to 1865, our use of low prices in the 1860s at worst only conservatively captures medium-term price trends.

[24] Over the full sample, price appreciation for banks is smaller and more variable in real terms, with means and standard deviations of 0.19% and 8.57% using the BLS price index and −0.32% and 8.90%

troughs that correspond closely with the stock price index, it becomes apparent that traded bank stocks experienced slow but steady capital appreciation with moderate but fairly predictable dividends through most of the sample period.

Overall, the price performance of industrial equities was anemic before 1855 but boomed during the Civil War. The capital-weighted price index increased by an average of 0.42% annually, with a standard deviation of 11.52%, but experienced slightly negative growth in real terms (−0.29% and −0.77% using the BLS and BDS prices). It would thus appear that the larger income distributions enjoyed by investors in manufacturing firms over those received by bank shareholders came at a cost of smaller and more variable capital gains.

Total Returns

While the series presented in Figs. 2 and 3 offer metrics by which to gauge price and income performance of listed banking and manufacturing equities, investors usually judge overall performance by the ability of a particular security to deliver returns from all sources. We thus construct series that reflect sectoral earnings by summing both the annual dividends and price appreciation (using low prices) for each firm and then dividing by the low price. The resulting total returns are then weighted both equally and by capitalization.

The uncertain timing of the reported low prices in most years requires the adoption of processing rules to approximate an annual return. Here, we construct the total return as

$$\mathrm{TR}_t = (\mathrm{PL}_{t+1} - \mathrm{PL}_t + \mathrm{D}_t)/\mathrm{PL}_t, \qquad (1)$$

where TR_t, PL_t, and D_t are the respective total return, low price, and dollar dividends for year *t*. These total returns would be technically correct only if actual trading prices were available at the start of each year. Snowden (1990) makes a similar timing assumption but with quarterly prices (see footnote 22). To be included in the total return series, a firm must have a low price available for both the current and following year.

The annual returns are presented in Figs. 5a and 5b. The bank stock returns are considerably smaller and less variable than the manufacturing stock returns, with bank stocks earning a capital-weighted mean return of 8.52% annually, with a standard deviation of 6.42%, as opposed to 9.66% and 12.03% for manufacturing stocks. After adjustment for changes in the price level, however, bank stock returns are only slightly less variable than manufacturing stock returns.[25] The

using BDS prices. These reductions, however, are largely due to inflation rates (in BLS prices) of 11.1% in 1861, 23.3% in 1862, and 27.0% in 1863. With these 3 years omitted, real price gains average 1.48% annually using BLS prices and 1.01% using BDS prices, with standard deviations of 7.71% and 8.14%.

[25] The standard deviation of real capital-weighted total bank stock returns rises to 10.26% using BLS prices and 10.44% using BDS prices, while the variability of real returns for manufacturing firms falls by less than 1%. The average of the real total returns falls to 8.01% (BLS) and 7.46% (BDS) for bank stocks and 8.81% (BLS) and 8.26% (BDS) for industrials.

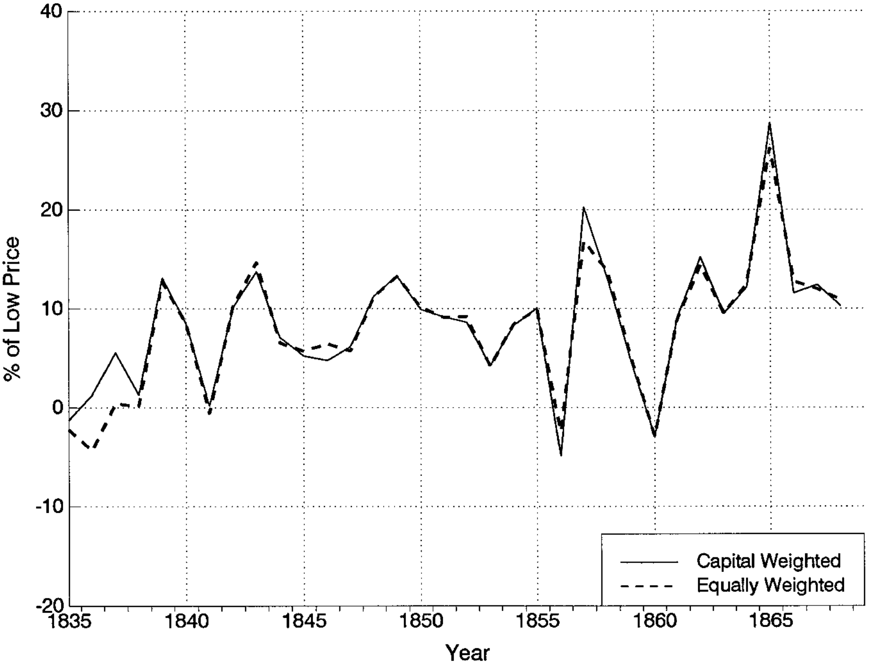

FIG. 5a. Annual holding returns for bank stocks.

bank total returns were larger and more variable than the dividend yields, which implies positive comovement between the price appreciation and dividend components. In contrast, the manufacturing stock returns were lower and much more variable than the dividend yields, implying negative comovement among the components. Peaks in nominal bank stock returns also precede peaks in manufacturing stock returns in 1844 and 1858, while upturns in the nominal banking series precede those for manufacturing in 1847, 1851, and 1863.

Interest Rates

In the absence of readily available sources of longer term financing (through, for example, stock issues or long-term bank loans), 19th-century businesses relied heavily upon short-term revolving trade credit and short-term bank loans to meet their financial needs. The resulting obligations were subsequently traded in the commercial paper market, and banks were active participants in this discount market, buying short-term self-liquidating loans. This market thus provides an important and continuing link between the banking sector and the real economy and plays a key role in Davis' (1965) story of the emergence of a national market after the Civil War. The commercial paper market, however, was extremely active much earlier in the East and Southeast, with rates regularly quoted in the fledgling commercial press such as *Niles Register*, *DeBow's Review*, and *Hunt's Merchants'*

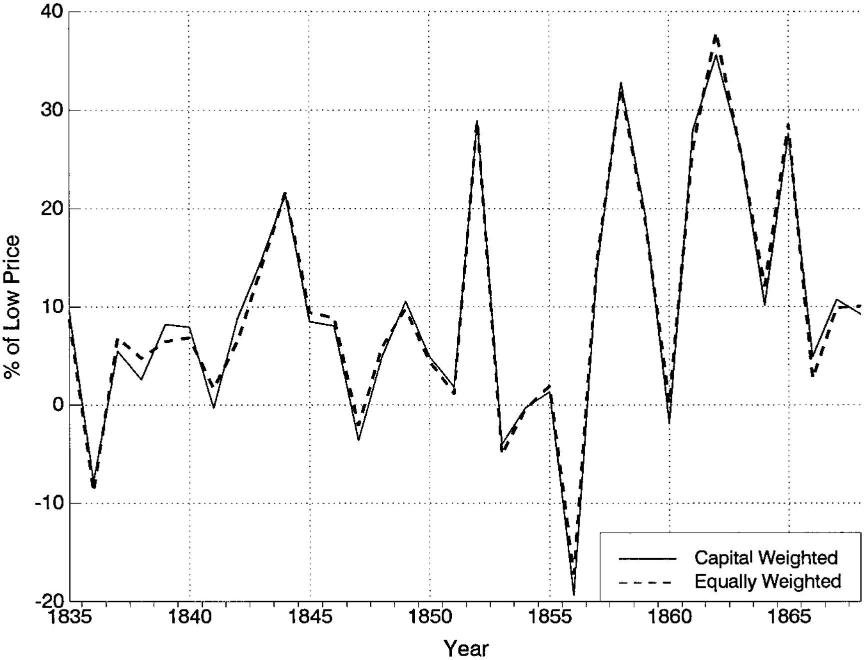

FIG. 5b. Annual holding returns for manufacturing stocks.

Magazine. Homer and Sylla (1995), for example, combine Erastus Bigelow's estimates of Boston first-class 3- to 6-month paper rates between 1835 and 1856 with New York rates on 60- to 90-day choice paper from Macaulay (1938) thereafter to generate a short-term interest rate series covering the period of interest to us here. The text of Martin (1871, pp. 37–40) also provides a series for "first class, three to six-month, bankable paper." Both are similar though not identical (Fig. 6).

Interest rates in this market should serve as a good proxy for monetary stringency (that is supply relative to demand) and default risk. Rates sometimes fluctuated sharply and within much wider bands than are common today. For example, in 1837—a crisis year—rates opened at 16%, advanced to 20% and receded to 13% in January (Martin, 1871, p. 37) before rising again and eventually reaching 32% in May, when banks suspended payments in specie, and ending the year at 10%. In contrast, rates in 1844 opened at 4%, rose to 5% in March, and remained at that level for the rest of the year. The data are broadly consistent with the dating of the early 19th-century business cycle (see Fig. 6).

BUSINESS CONDITIONS, 1835–1869

"Precise" dating of the business cycle by the National Bureau of Economic Research begins with the cycle trough in December 1854 and continues to the

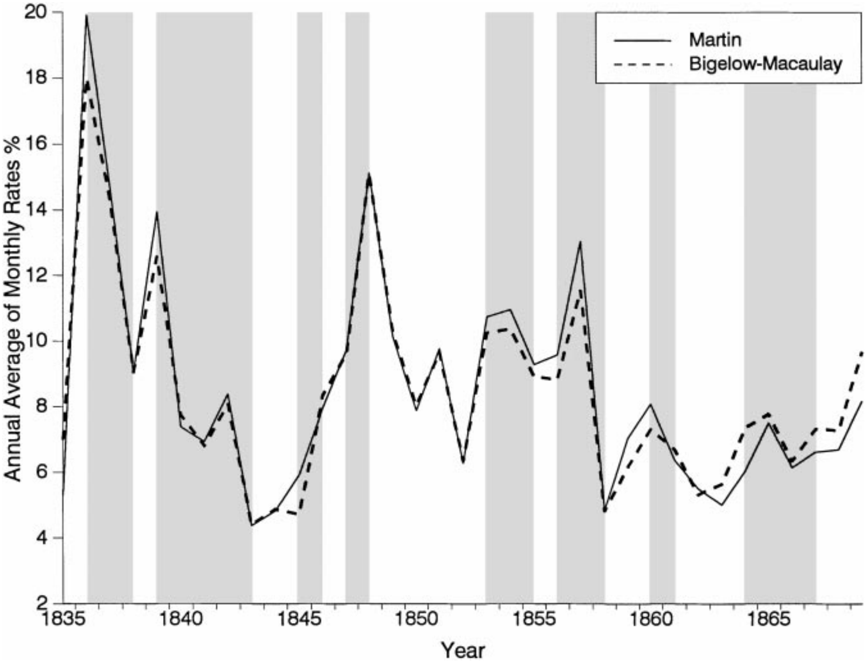

FIG. 6. Interest rates on short-term bankable paper, with business contractions from Burns and Mitchell (1946) shaded.

present. Cyclical fluctuations were present at earlier dates (for example, following the end of the Napoleonic Wars in Europe) but the dating is less exact. During the early period under consideration here, Burns and Mitchell (1946, p. 78) provide the calendar-year reference dates of 1836, 1839, 1845, 1847, 1853, 1856, 1860, 1864, and 1869 for business cycle peaks, with troughs in 1838, 1843, 1846, 1848, 1855, 1858, 1861, and 1867. One might quibble with some of this dating (for example, the ‘‘peak’’ in 1845); the point, however, is that the period under consideration was not one of either unbridled expansion or unrelieved gloom. Financial conditions and business prospects changed and were subject to periodic fluctuations, some originating domestically (for example, the Civil War), others internationally (Temin (1969, p. 146), for example, argues that financial stringency in London played a role in the 1837 crisis).[26] An obvious question given our three financial series here—industrials, bank shares, and commercial papers—is how these three markets related to one another and to the business cycle.

Bank stocks, for example, were relatively stable in price throughout the period and provided a more constant earnings stream than the other assets considered here. Industrials were more variable with respect to both price and dividends,

[26] See Temin (1998) for an interesting analysis of the relative importance of domestic and foreign factors in U.S. business cycles over the past century.

while commercial paper rates varied dramatically over short time horizons. The start of our period, 1835, is described as a ‘‘golden age for money borrowers’’ (Martin, 1871, p. 28) with low (though not exceptionally low) interest rates of around 5%. Rates rose throughout 1836 and into 1837, which was described as a ‘‘crisis’’ year with ‘‘stocks down and money-market tight as a drum-head’’ (Martin, 1871, p. 29). Banks in New York suspended specie payment of notes on May 10, 1837. Boston banks followed 2 days later.

Two listed banks failed in 1837: the Franklin Bank and the Lafayette Bank. Four more failed the following year (American, Commonwealth, Fulton, and Hancock) despite an easing of money and interest rates, and two others quit (Commercial and Oriental)—presumably paying their obligations in full. The situation tightened but no other listed Boston banks failed until the Cochituate Bank in 1854.

Financial conditions generally improved after early 1840. Indeed, for 1843 Martin talks about an ‘‘unusual plethora in the Money-Market’’ (Martin, 1871, p. 32). Commercial paper rates remained low until 1847 and 1848 and were high again in 1854/1855 and 1857. Surprisingly, the Civil War and associated uncertainties barely seem to have caused a ripple in the market.

None of the industrials listed on the Boston stock exchange failed before 1857, when Bay State Mills (capitalized at $1.8 million) and the Salisbury Mills (capitalized at $700,000) failed. New companies, however, were established on their remains. Subsequently, the Portsmouth Steam Mills failed in 1865 and the James Steam Mills failed in 1869. Although our analysis ends in 1869, five listed companies—Androscoggin, Bates, Laconia, Naumkeag, and Pepperell Mills—are also known to have failed in 1870, with losses totaling at least $1.8 million. If our coverage had extended this far, these failures would have materially affected our price indexes.

BANK RETURNS AND INDUSTRIAL PERFORMANCE

Our new series for banking and manufacturing stocks traded in the early Boston equity market allow us to assess the degree to which disturbances in the banking sector affected the prospects and performance of industrial firms. If Boston bank directors were as closely connected to particular industrial interests as Dalzell (1987) suggests,[27] and if these ties encouraged investors to place surpluses with banks despite the presence of distortionary informational frictions, it would not be surprising to find interesting intersectoral linkages in the lag structures of our indexes. The descriptive account of Davis (1960) also offers reason to suspect that negative shocks in the banking sector (such as those attributable to nonperforming loans and loss of public confidence in the safety of deposits) lowered the supply of loans and led to higher interest rates, which in turn had a dampening effect on

[27] Dalzell (1987, pp. 233–238) lists the business corporations in which the ‘‘Boston Associates’’ were active between 1813 and 1865. Among the 77 associates listed that had interests in one or more textile firms, 24 were known to be actively involved with at least one Boston bank.

industrial performance. Although an annual series for manufacturing production in New England is generally unavailable for our time period, changes in stock prices should reflect expectations of future economic performance and, to the extent that these expectations become self-fulfilling, offer a reasonable (if perhaps leading) indicator of economic conditions within the sector.

We use a set of vector autoregressive (VAR) models to explore the possibility that bank stock returns influenced interest rates and industrial stock prices. While a leading role for changes in banking sector fundamentals may trouble observers of modern financial markets by violating notions of strong-form market efficiency, close links between banks and particular industries did not eliminate the fundamental informational asymmetries between banks and their funding sources, but rather allowed investors to overcome them. The remaining inefficiencies, combined with the tendency for banks to smooth total stock returns, could easily lead to lags in the transmission of banking shocks to interest rates, especially in light of minimal reporting of the condition of individual balance sheet assets. It is just these types of deviations from strong-form efficiency that allow us to examine the centrality of banks in the economic activity of mid-19th-century New England.

The VARs include our indexes of stock prices, returns, and short-term lending rates. We hypothesize that fluctuations in bank stock returns should reflect shifts in sectoral fundamentals that may affect lending rates, while fluctuations in manufacturing stock prices should to some extent reflect events in the banking sector and their transmission through these rates. Standard VAR analysis involves the estimation of a separate regression equation for each of the variables in a system on its own lags and lags of the other system variables. Least-squares estimation is possible because the design matrix consists entirely of predetermined variables and is identical for each equation in the system. For example, the first VAR system that we estimate (Model 1) has the form

$$\mathrm{MPL}_t = \mu_1 + \sum_{i=1}^{2} \alpha_{1,i}\mathrm{MPL}_{t-i} + \sum_{i=1}^{2} \beta_{1,i}\mathrm{BTR}_{t-i} + \sum_{i=1}^{2} \gamma_{1,i}\mathrm{LINT}_{t-i} + \epsilon_{1,t} \tag{2a}$$

$$\mathrm{BTR}_t = \mu_2 + \sum_{i=1}^{2} \alpha_{2,i}\mathrm{MPL}_{t-i} + \sum_{i=1}^{2} \beta_{2,i}\mathrm{BTR}_{t-i} + \sum_{i=1}^{2} \gamma_{2,i}\mathrm{LINT}_{t-i} + \epsilon_{2,t} \tag{2b}$$

$$\mathrm{LINT}_t = \mu_3 + \sum_{i=1}^{2} \alpha_{3,i}\mathrm{MPL}_{t-i} + \sum_{i=1}^{2} \beta_{3,i}\mathrm{BTR}_{t-i} + \sum_{i=1}^{2} \gamma_{3,i}\mathrm{LINT}_{t-i} + \epsilon_{3,t}, \tag{2c}$$

where MPL is the annual percentage growth rate of the manufacturing stock price index, BTR is the level of bank stock returns, and LINT is the change in the lending rate.[28] We use a series of tests for Granger noncausality to evaluate the

[28] Augmented Dickey–Fuller tests, for which the Akaike and Schwartz criteria lead us to select two-lag specifications, are unable to reject the null hypothesis of nonstationarity for prices and short-term interest rates, and thus justify differencing these series. The unit root tests are inconclusive

TABLE 1
Estimates for Vector Autoregressive Models

	Model 1						
	MPL_{-1}	MPL_{-2}	BTR_{-1}	BTR_{-2}	$LINT_{-1}$	$LINT_{-2}$	R^2
MPL	0.442	−0.009	1.362	−0.822	−2.155	−0.291	0.648
	(2.442)	(0.064)	(5.597)	(2.583)	(3.653)	(0.646)	
P value	0.062		0.000		0.003		
BTR	−0.157	0.138	0.039	0.117	0.201	−0.310	0.726
	(1.035)	(1.168)	(0.191)	(0.439)	(0.406)	(0.822)	
P value	0.387		0.862		0.464		
LINT	0.005	0.011	−0.182	0.151	−0.361	−0.243	0.493
	(0.082)	(0.236)	(2.273)	(1.442)	(1.864)	(1.645)	
P value	0.963		0.072		0.148		
	Model 2						
	BPL_{-1}	BPL_{-2}	MTR_{-1}	MTR_{-2}	$LINT_{-1}$	$LINT_{-2}$	R^2
BPL	0.211	−0.227	0.298	−0.153	0.599	0.072	0.590
	(1.002)	(1.381)	(5.006)	(1.901)	(1.964)	(0.370)	
P value	0.273		0.000		0.161		
MTR	−1.036	−0.127	0.239	0.195	−0.054	−0.210	0.509
	(1.444)	(0.227)	(1.178)	(0.707)	(0.052)	(0.316)	
P value	0.351		0.316		0.950		
LINT	0.063	0.057	−0.059	0.081	−0.536	−0.234	0.473
	(0.425)	(0.494)	(1.403)	(1.409)	(2.478)	(1.699)	
P value	0.798		0.223		0.046		

Note. The table contains estimation results for three-variable VARs with two lags of the system variables and a constant. The rows for Models 1 and 2 correspond to Eqs. (2a–2c) and (3a–3c), respectively. The dependent variable for each equation is listed in the left column. Coefficient estimates appear in the columns for the independent variables, with *t* statistics in parentheses. The row labeled "*P* value" for each equation reports the tail probability for the null hypothesis that the lags of each system variable are jointly zero (Granger noncausality).

ability of the lagged values of each system variable to jointly improve upon forecasts of one-step ahead changes in the other system variables. Since "economic causality" is predicated on the inclusion of the full information set in the VAR and this condition is necessarily violated in any finite regression framework, our results can only be interpreted as strongly suggestive of the nature of timing relationships among the variables in the system. The choice of two lags in each VAR is based on a series of nested likelihood ratio tests that evaluate the significance of sequentially omitted lags, starting with a four-lag specification.

The upper panel of Table 1 reports estimates for the VAR specified in Eqs. (2a)–(2c). Changes in bank stock returns Granger-cause growth in manufacturing

for returns, however, and given the low power of the tests, our initial specification with stock returns in levels is quite plausible.

stock prices at the 1% level, with a positive sum of the coefficients on the lags of bank stock returns. They Granger-cause changes in lending rates at the 7% level with negative coefficients. Changes in lending rates also Granger-cause growth in the manufacturing stock price index at the 1% level with negative coefficients, but do not Granger-cause changes in bank stock returns. In addition, the growth rate of the manufacturing stock price index causes neither interest rates nor bank stock returns. These results imply a propagation mechanism that transmits shocks to the earnings of bank shareholders to the manufacturing sector both directly and through an increase in interest rates. The lack of feedback from manufacturing stock prices to the other variables suggests that the posited mechanism reflects the dominant causal direction.

In the lower panel, we report results for Model 2, which reverses the roles of the manufacturing and banking sectors:

$$\text{BPL}_t = \mu_1 + \sum_{i=1}^{2} \alpha_{1,i}\text{BPL}_{t-i} + \sum_{i=1}^{2} \beta_{1,i}\text{MTR}_{t-i} + \sum_{i=1}^{2} \gamma_{1,i}\text{LINT}_{t-i} + \epsilon_{1,t} \tag{3a}$$

$$\text{MTR}_t = \mu_2 + \sum_{i=1}^{2} \alpha_{2,i}\text{BPL}_{t-i} + \sum_{i=1}^{2} \beta_{2,i}\text{MTR}_{t-i} + \sum_{i=1}^{2} \gamma_{2,i}\text{LINT}_{t-i} + \epsilon_{2,t} \tag{3b}$$

$$\text{LINT}_t = \mu_3 + \sum_{i=1}^{2} \alpha_{3,i}\text{BPL}_{t-i} + \sum_{i=1}^{2} \beta_{3,i}\text{MTR}_{t-i} + \sum_{i=1}^{2} \gamma_{3,i}\text{LINT}_{t-i} + \epsilon_{3,t}. \tag{3c}$$

In this system, BPL is the annual percentage growth rate of the bank stock price index, MTR is the level of manufacturing stock returns, and LINT is again the change in the lending rate. Here, changes in manufacturing stock returns Granger-cause growth in the bank stock price index at the 1% level, while changes in lending rates do not Granger-cause bank stock prices at conventional significance levels. The positive coefficients on the lending rate also contrast sharply with those obtained for the first equation of Model 1. In particular, a role for rising interest rates in improved bank stock price performance might derive from passive profit-taking by banks during the early and middle phases of business expansions. Changes in manufacturing stock returns do not Granger-cause changes in the lending rate. Combined with the results for Eq. (3c), this suggests that lending rates were less sensitive to manufacturing stock returns than to bank stock returns and that the transmission of manufacturing shocks to the banking sector did not involve lending rates.

The inconclusive unit root tests for banking and industrial stock returns (see footnote 28) suggest that differencing these series might be appropriate prior to estimating Models 1 and 2. This is because the inclusion of an integrated variable in a VAR that is not cointegrated will produce test statistics for Granger noncausality which do not conform to standard distributions. An inability to reject nonstationarity for our dividend yields also justifies consideration of this alternative stationarity assumption. Table 2 reports the results, which continue to support

TABLE 2
VAR Estimates with Differenced Stock Returns

	Model 1						
	MPL_{-1}	MPL_{-2}	BTR_{-1}	BTR_{-2}	$LINT_{-1}$	$LINT_{-2}$	R^2
MPL	0.477	0.034	1.206	0.219	−2.155	−0.383	0.619
	(2.254)	(0.172)	(5.300)	(0.654)	(3.418)	(0.705)	
P value	0.041		0.000		0.008		
BTR	−0.269	0.135	−0.705	−0.186	0.274	−0.298	0.396
	(1.362)	(0.726)	(3.325)	(0.596)	(0.467)	(0.588)	
P value	0.409		0.010		0.672		
LINT	0.005	0.007	−0.173	−0.017	−0.363	−0.234	0.492
	(0.069)	(0.104)	(2.409)	(0.163)	(1.825)	(1.363)	
P value	0.985		0.074		0.155		
	Model 2						
	BPL_{-1}	BPL_{-2}	MTR_{-1}	MTR_{-2}	$LINT_{-1}$	$LINT_{-2}$	R^2
BPL	0.241	−0.014	0.291	0.126	0.715	0.237	0.587
	(1.192)	(0.066)	(5.007)	(1.595)	(2.341)	(1.025)	
P value	0.464		0.000		0.083		
MTR	−1.265	−0.819	−0.709	−0.407	−0.470	−0.720	0.437
	(1.791)	(1.112)	(3.493)	(1.481)	(0.441)	(0.892)	
P value	0.049		0.007		0.670		
LINT	0.119	0.023	−0.072	−0.021	−0.535	−0.273	0.474
	(0.831)	(0.154)	(1.755)	(0.375)	(2.482)	(1.671)	
P value	0.631		0.221		0.049		

Note. See note for Table 1. In these specifications, the total returns of traded banks (BTR) and manufacturing firms (MTR) enter the VAR systems in first differences rather than levels.

our main findings. Specifically, changes in bank stock returns and lending rates continue to Granger-cause manufacturing stock prices at less than the 1% level, increases in bank stock returns lower lending rates, and changes in manufacturing stock returns do not influence bank stock prices through an interest rate channel.

The processing rule adopted for computing total returns (see Eq. (1)) makes possible some degree of simultaneity between prices and returns. For example, if the low prices used to compute bank stock returns were observed at the end of each calendar year and the low prices for manufacturing firms were observed at the start, the power of the first ‘‘lag’’ of changes in bank stock returns to predict ‘‘current’’ manufacturing stock price appreciations in Eq. (2a) could be a result of contemporaneous correlation. Although this extreme case is unlikely, price observations that deviate from the start of each calendar year can contribute information from year $t + 1$ to a year t variable. The limitations of Martin’s annual high and low prices make it impossible for us to evaluate the severity of these effects over the full 1835–1869 period, but we do note that the potential simultaneity problem vanishes if changes in total bank stock returns can affect

TABLE 3
Estimates for Model 1 with Semiannual Data

	MPL_{-1}	MPL_{-2}	MPL_{-3}	BTR_{-1}	BTR_{-2}	BTR_{-3}	$LINT_{-1}$	$LINT_{-2}$	$LINT_{-3}$	R^2
MPL	−0.304	−0.012	0.429	1.865	1.822	1.589	−1.679	−1.288	−1.592	.646
	(1.715)	(0.060)	(2.172)	(3.853)	(3.222)	(3.102)	(1.798)	(1.315)	(2.343)	
P value		0.129			0.006			0.097		
BTR	−0.147	−0.081	0.115	−0.591	−0.428	−0.038	−0.342	−0.463	−0.382	.602
	(1.741)	(0.825)	(1.147)	(2.580)	(1.556)	(0.158)	(0.773)	(0.972)	(−1.187)	
P value		0.293			0.054			0.652		
LINT	0.078	0.014	0.068	−0.179	−0.010	0.028	−0.413	−0.222	0.160	.742
	(1.785)	(0.273)	(1.321)	(1.515)	(0.066)	(0.222)	(1.808)	(0.902)	(0.962)	
P value		0.137			0.243			0.142		

Note. See note for Table 1. The system includes three lags of each variable (with lag order selected with nested likelihood ratio tests), a constant, and a semiannual dummy. Bank stock returns enter the system in first differences.

lending rates and manufacturing stock prices in the same calendar year, while there is some lag in the transmission of shocks in lending rates and manufacturing stock prices to reported bank stock returns. In fact, this is likely given the tendency for mid-19th-century bank directors to smooth dividends (see Fig. 2a) and postpone write-offs of bad loans—particularly those granted to themselves or other insiders (Baskin, 1988; Lamoreaux, 1994).

We next reestimated the VARs with the more precisely timed data which Martin published in supporting worksheets from 1854 onward to verify the robustness of our findings and to shed some light on the severity of timing issues. To make the comparison, we applied the same procedures described earlier to construct semiannual series for prices and returns using January 2 and July 1 (ex-dividend) prices in each year from 1854 to 1869.[29] We also used Martin's notes to build a semiannual interest rate series with the same periodicity. The results for Model 1 in the shortened sample appear in Table 3.[30] Bank stock returns and interest rates continue to influence manufacturing stock prices, but the coefficients on bank returns in the interest rate equation (2c), while still with a negative sum, are no longer jointly significant. This might be expected, however, given that the information frictions upon which the lag structure was based for the full sample were certainly less severe by 1860. In addition, the impulse response function for Eq. (2c), regardless of variable placement, suggests an immediate fall in interest rates as bank stock returns rise and a subsequent increase in manufacturing stock

[29] Given the thinness of the market for industrials, we chose a single dividend cycle of 6 months as our unit of time rather than quarters, which generate much more volatile (and perhaps less reliable) price series.

[30] Bank stock returns enter the system in first differences, since unit root tests are clearly unable to reject nonstationarity in the shortened sample. The results for Model 2 (not shown) with the shortened sample closely resemble those reported in Table 2, though lending rates are no longer significant in Eq. (3a).

prices that generates an offsetting rise in interest rates. These results offer further indication that distortions associated with the use of annual low prices over the full period were probably not severe.

CONCLUSION

The returns to stockholders in the early to middle 19th century who had invested in securities traded on the Boston stock market, like those to investors on the New York exchange a few decades later, came largely from dividends rather than price appreciation—the source of most of the gains on most markets today. The investor who put $1 in the market in 1835 would have been lucky to get that dollar back for his stock for most of the next 35 years. Indeed, to the extent that there was inflation, investors who sold stock at almost any time during this period (unless they had managed to buy low and were selling high) were unlikely to recover the real purchasing power of their initial investments. In terms of price performance, the stock market doldrums of the 1970s and early 1980s look good beside the 1835–1860 period. Certainly, no period during the 19th century approaches the price gains recorded during any of the 20th-century bull markets.

In part this differential performance between then and now reflects differences in corporate strategy. In the 19th century, incorporated businesses seem to have followed a policy of keeping the market price of their shares more or less equal to the par value of the shares which represented the stockholder's liability under the "trust fund" doctrine. To this end, firms distributed most of the profits that they earned. These distributions may have served as indicators of management performance in the presence of imperfect and limited information. But if they did, investors must not have expected high or low profits to persist, for they did not dramatically bid up the prices of the stock of those firms that were particularly successful nor drive down the prices of those that were markedly unsuccessful.

In the absence of discriminatory tax policy, the rational investor should be indifferent between dividend payouts and capital gains; that is, the investor is really concerned with the total return regardless of whether this is paid in the form of semiannual dividend payments or capital gains that might be cashed out at any time. By this measure, investors in the Boston stock market did very well between 1835 and 1869. In nominal terms, $1 invested in the market in 1835 would have grown nearly 19-fold by 1869 if invested in industrials (Fig. 7). If invested more conservatively in the banks that financed business including manufacturing, the $1 still would have grown 15-fold during the same period. Even in real terms, the gains were large—14-fold and 12-fold using the BLS price index and 12-fold and 10-fold using the BDS price index.

Over the entire period, this performance exceeds that recorded by the New York Stock Exchange over any comparable historical period (except the present). Certainly, the early Boston equity market did better than the NYSE during the 60 years preceding the 1929 crash (Snowden, 1990). At the same time, the graph of cumulative total returns makes clear that the success of an industrial investment in the Boston market depended heavily upon gains (in price and dividends) realized

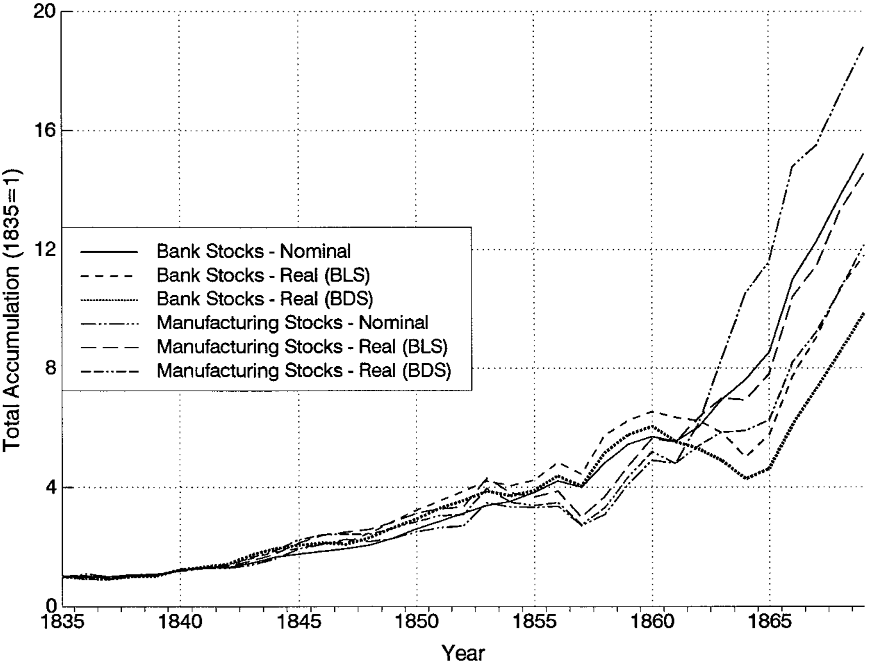

FIG. 7. Cumulative return from initial $1 stock market investment.

during and immediately after the Civil War. This raises questions (unexplored here) regarding the modern inclination to dismiss the Beard–Hacker thesis regarding the stimulus to American industry and industrialization from the war (see, for example, Engerman, 1966).[31] The war seems to have had a major impact, at least on the Boston stock market, and presumably some of this must have spilled over to the regional markets and eventually to the national market on Wall Street.

Our investigation of the performance of the Boston stock market at this time also suggests that financial difficulties originating in the banking sector were transmitted to manufacturing firms, probably via the commercial paper market, rather than the reverse. That is to say, changes in bank stock returns Granger-cause changes in manufacturing stock price performance and Granger-cause changes in lending rates. Changes in lending rates also Granger-cause changes in industrial stock performance but not in bank stocks. Losses and payment problems of the nation's major manufacturers, on the other hand, do not seem to explain movements in short-term interest rates and the earnings of creditor banks.

[31] We acknowledge that the deepening of the market for industrial equities that resulted from active trading during the Civil War (and especially in the final quarter of 1862) probably had some permanent effect on the level of stock prices, but maintain that such price effects can only partially account for the rapid and large increases in cumulative real returns that we observe.

Consequently, the financial sector seems to have played a pivotal role in New England's industrial development and probably elsewhere too, as other work suggests.

APPENDIX

This appendix presents the new time series described in the paper. Tables A1 and A2 include price indexes for the banking and manufacturing sectors based on low and high prices in each year weighted both equally and by the share of each firm in total sector capitalization. Tables A3 and A4 present par-value dividends, dividend yields, and total returns for banks and industrials, also weighted equally and by capital share.

TABLE A1
Price Indexes for Banks Traded in the Boston Stock Market, 1835–1869

	High prices		Low prices	
Year	Capital wt.	Equal wt.	Capital wt.	Equal wt.
1835	100.00	100.00	100.00	100.00
1836	98.23	97.94	92.60	93.20
1837	95.12	94.62	87.41	84.73
1838	93.02	89.66	86.13	80.30
1839	92.89	89.57	81.88	75.78
1840	91.39	88.63	86.63	80.25
1841	91.90	88.84	88.67	82.49
1842	87.31	83.82	83.35	76.95
1843	91.39	88.00	86.52	80.11
1844	93.18	90.06	93.23	87.16
1845	96.67	93.91	94.53	87.87
1846	95.75	93.45	93.08	86.88
1847	94.34	92.35	90.94	86.24
1848	91.37	89.57	89.74	84.73
1849	95.85	93.48	92.41	87.12
1850	99.90	97.77	96.82	91.40
1851	100.89	98.68	99.08	93.37
1852	103.21	101.27	100.68	95.00
1853	102.93	101.09	101.67	96.43
1854	102.81	101.66	98.81	93.90
1855	102.02	100.69	98.85	93.79
1856	102.04	100.63	101.02	95.65
1857	102.33	101.08	88.37	85.96
1858	103.45	102.35	98.73	93.15
1859	104.64	103.68	104.45	99.11
1860	106.71	105.84	102.37	97.44
1861	103.64	102.95	92.33	87.98
1862	100.00	99.24	93.91	89.41
1863	104.91	104.06	101.88	96.35
1864	119.27	116.88	104.58	98.83
1865	122.98	120.75	106.12	100.54
1866	123.31	121.19	113.10	105.87
1867	123.49	122.25	115.58	109.37
1868	127.41	126.36	119.65	112.67
1869	127.80	127.74	121.06	114.60

Note. The table lists price indexes for traded bank stocks, with 1835 = 100. The columns include the capital and equally weighted series that correspond to Fig. 3a in the text.

TABLE A2
Price Indexes for Industrials Traded in the Boston Stock Market, 1835–1869

	High prices		Low prices	
Year	Capital wt.	Equal wt.	Capital wt.	Equal wt.
1835	100.00	100.00	100.00	100.00
1836	102.78	102.12	100.20	98.90
1837	93.98	92.25	83.90	81.93
1838	94.18	91.75	84.68	83.14
1839	90.42	89.68	81.89	81.44
1840	82.10	80.90	81.40	79.88
1841	83.85	83.18	85.15	82.82
1842	78.93	78.09	77.87	77.39
1843	86.67	85.45	81.93	79.83
1844	96.01	94.98	89.31	86.77
1845	103.31	102.07	96.21	93.83
1846	102.78	101.20	92.04	90.70
1847	95.21	95.23	85.25	85.29
1848	82.62	84.24	73.81	74.92
1849	82.65	83.43	71.50	73.05
1850	82.20	83.57	74.17	74.82
1851	80.01	81.75	71.48	71.53
1852	85.28	85.16	68.97	68.52
1853	86.76	86.37	83.50	83.60
1854	80.03	80.26	73.21	72.54
1855	72.25	71.63	66.56	65.99
1856	69.16	69.21	63.75	63.56
1857	63.88	63.77	46.66	47.64
1858	64.97	63.53	48.11	49.51
1859	72.31	70.44	61.98	63.71
1860	86.46	84.35	68.52	70.07
1861	78.41	77.47	59.94	62.59
1862	109.00	107.17	70.84	72.79
1863	123.55	118.97	85.87	89.83
1864	120.56	119.35	90.86	94.92
1865	125.35	124.68	89.05	94.34
1866	127.80	128.52	102.52	109.31
1867	116.15	117.58	91.99	95.32
1868	116.17	113.85	92.20	94.69
1869	112.98	111.04	92.38	95.54

Note. The table lists price indexes for traded manufacturing stocks, with 1835 = 100. The columns include the capital and equally weighted series that correspond to Fig. 3b in the text.

TABLE A3
Dividends and Total Returns of Banks Traded in the Boston Stock Market, 1835–1869

	Dividends (% of par)		Dividend yields		Total returns	
Year	Capital wt.	Equal wt.	Capital wt.	Equal wt.	Value wt.	Equal wt.
1835	5.90	6.01	6.12	6.10	−1.28	−2.28
1836	6.13	6.41	7.16	6.81	1.27	−4.39
1837	5.89	5.81	6.98	6.77	5.53	0.37
1838	5.30	5.23	6.18	6.04	1.24	0.17
1839	5.86	5.75	7.31	7.13	13.12	12.75
1840	5.39	5.25	6.19	5.99	8.55	8.54
1841	5.41	5.59	6.16	6.35	0.16	−0.62
1842	5.30	5.08	6.31	6.11	10.11	10.23
1843	5.19	5.10	5.99	5.91	13.75	14.71
1844	5.27	5.30	5.69	5.72	7.08	6.52
1845	6.24	6.32	6.76	6.85	5.23	5.73
1846	6.49	6.58	7.08	7.21	4.78	6.47
1847	6.75	7.10	7.63	7.76	6.12	5.71
1848	7.35	7.56	8.30	8.39	11.26	11.20
1849	7.90	8.06	8.59	8.67	13.30	13.26
1850	7.35	8.36	8.06	8.61	9.92	10.16
1851	7.52	7.82	7.82	7.86	9.20	9.10
1852	7.72	7.80	7.66	7.71	8.64	9.21
1853	7.16	8.08	7.69	7.87	4.19	4.12
1854	8.06	8.77	8.37	8.82	8.31	8.46
1855	7.54	7.87	7.86	7.94	10.05	9.92
1856	7.67	7.79	7.65	7.70	−4.87	−2.43
1857	7.51	7.71	8.57	8.47	20.29	16.83
1858	6.94	7.27	7.29	7.40	13.08	13.80
1859	6.73	7.05	6.69	6.77	4.70	5.09
1860	6.77	7.21	6.95	7.06	−2.95	−2.99
1861	6.49	6.65	7.30	7.25	9.01	8.88
1862	6.09	6.25	6.70	6.66	15.19	14.43
1863	6.82	7.00	6.85	6.94	9.50	9.50
1864	10.72	11.14	10.77	11.01	12.16	12.50
1865	22.87	21.68	22.20	20.93	28.78	26.23
1866	10.05	10.11	9.37	9.48	11.56	12.79
1867	9.78	9.93	8.89	8.99	12.41	12.00
1868	10.29	10.38	9.12	9.18	10.29	10.90
1869	10.33	10.32	9.00	8.99	NA	NA

Note. The table lists dividends as a percent of par value, dividend yields (percent of low price), and total returns (dividends and capital gains as percent of low price) for bank stocks on both a capital and equally weighted basis. The dividend yields correspond to Fig. 2a in the text. The total returns correspond to Fig. 5a.

TABLE A4
Dividends and Total Returns of Traded Industrials, 1835–1869

	Dividends (% of par)		Dividend yields		Total returns	
Year	Capital wt.	Equal wt.	Capital wt.	Equal wt.	Capital wt.	Equal wt.
1835	10.20	12.22	11.30	11.20	9.45	8.70
1836	10.19	12.64	10.52	10.27	−7.87	−8.86
1837	4.42	6.26	5.57	6.46	5.48	6.80
1838	5.67	7.03	6.53	7.68	2.53	4.73
1839	7.91	8.02	8.88	8.37	8.20	6.46
1840	3.85	4.50	3.87	3.72	7.93	6.82
1841	8.06	8.48	9.05	9.18	−0.30	1.65
1842	3.39	3.20	3.62	3.47	8.77	6.46
1843	6.08	6.23	5.83	5.57	14.72	14.02
1844	15.43	16.79	14.03	14.20	21.47	21.69
1845	13.64	15.17	14.53	14.64	8.48	9.41
1846	15.54	15.02	16.07	15.34	8.05	8.88
1847	9.18	10.52	11.26	11.05	−3.64	−2.12
1848	6.40	7.51	9.06	9.06	4.85	5.82
1849	5.94	7.19	8.02	8.22	10.56	9.74
1850	7.30	7.63	8.97	9.09	4.89	4.44
1851	4.51	4.54	5.67	5.65	1.79	1.15
1852	5.97	5.33	8.01	7.16	28.96	28.97
1853	7.61	7.50	8.27	8.17	−4.05	−5.06
1854	7.00	6.93	8.72	8.60	−0.32	−0.46
1855	4.60	4.78	5.85	5.88	1.31	1.90
1856	5.50	6.10	8.26	8.48	−19.39	−17.20
1857	4.96	5.23	11.59	11.52	13.99	14.89
1858	2.57	3.10	4.12	3.76	32.84	32.24
1859	7.29	7.36	9.16	9.26	19.46	18.81
1860	8.96	9.56	11.31	11.55	−1.93	0.11
1861	7.03	7.62	10.08	10.35	27.98	26.19
1862	12.77	13.07	14.64	14.82	35.61	37.89
1863	21.90	21.32	20.60	20.56	26.06	25.78
1864	15.14	15.59	12.35	13.00	10.15	12.11
1865	14.85	15.68	12.68	12.96	27.60	28.54
1866	19.86	21.29	15.42	15.80	4.90	2.66
1867	13.24	13.75	10.67	10.82	10.73	9.93
1868	10.98	11.31	9.19	9.39	9.25	10.08
1869	12.20	12.34	9.98	9.80	NA	NA

Note. The table lists dividends as a percent of par value, dividend yields (percent of low price), and total returns (dividends and capital gains as percent of low price) for manufacturing stocks on both a capital and equally weighted basis. The dividend yields correspond to Fig. 2b in the text. The total returns correspond to Fig. 5b.

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