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BUSINESS ACTIVITY AND THE BOSTON STOCK MARKET, 1835-1869

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ABSTRACT

This paper examines the performance of the Boston stock market, the nation's premier market for industrials, between 1835 and 1869, developing new indexes of price performance, dividend yields and total holding period returns for bank stocks and industrial equities using annual data from Martin (1871). Using these new series and a set of VAR models we conclude that disturbances in the banking sector, as manifested by declines in total stockholder returns, led to increases in short-term lending rates which in turn led to declines in the price performance of traded manufacturing firms. There is no evidence of feedback from manufacturing returns to bank stock prices via lending rates. The findings are consistent with a key role for banks in nineteenth century business fluctuations.

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The deepening and broadening of financial intermediation such as occurred in the United States in the nineteenth century is both a growth-inducing factor by mobilizing accumulated capital as well as a key indicator of economic development by facilitating transactions and reducing the importance of personal relationships. Given the importance of these changes, it is not surprising that a number of recent studies have re-examined various aspects of financial intermediation during the antebellum period. Lamoreaux (1985; 1994), for example, has investigated the relationship between industrial development in New England and bank lending practices, focusing in particular upon the switch from highly personalized insider lending before the Civil War to more impersonal lending thereafter. She finds that insider lending which was common early on served as a signal of bank quality to small generally uninformed savers while simultaneously reducing the problem of asymmetric information for bank loan officers, rather than acting as a source of increased moral hazard which is the way in which we view such activities today. More recently, Bodenhorn (1992; 1997) has extended Lance Davis' work (1965) on regional short-term interest rates back to the antebellum period and finds that regional interest rates were converging in the years before the Civil War much as they did afterwards, suggesting that a national market was emerging much earlier than hitherto supposed only to be split apart by the Civil War. Lastly, Wachtel and Rousseau (1995) and Rousseau and Wachtel (1997) have found evidence of a leading role for increases in the intensity of financial intermediation in the long-run economic performance of the U.S. (and other industrialized countries) over the postbellum period.

Our paper expands the scope of these studies to the stock market by examining the behavior of equity securities traded on the Boston Stock Exchange before, during, and immediately following the Civil War. Specifically, we use annual data from Martin (1871) for banks and manufacturing firms traded between 1835 and 1869 to construct measures of market performance which we then relate to business fluctuations.

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, stock market capitalization in the banking and manufacturing sectors grew at average annual rates of 3.5 and 3.3 percent. Although modest by the standard of today's emerging markets, this growth is about double the rate of population growth and thus implies a growing importance of equity markets in the allocation of financial resources. Our performance measures confirm this conjecture. These measures also suggest that the transmission mechanism for business cycles at this time went from disturbances in the banking system to changes in market prospects for manufacturing interests.

The paper is organized as follows. Section I describes the nature of the Boston stock market and the peculiarities of industrial securities at this time. Section II describes the data sources and methods used to construct measures of overall economic performance of listed firms, and presents plots of the resulting series. Section III discusses the apparent movements in the various different series and their relation to specific events in the Boston area over the 1835-1869 period. Section IV examines the time series characteristics of the data and constructs a set of vector autoregressive (VAR) models that provide statistical evidence in favor of shocks flowing from the banking sector to the manufacturing sector. Section V summarizes our findings and posits an interpretation for the results. An Appendix includes the actual new time series.

I. Equity Securities and the Boston Stock Exchange

Although the Boston stock market was not formally established until October 1834, an informal exchange had operated in Boston back at least to 1798 (Martin, 1871, p. 7). Thus, for example, Martin (who incidentally operated both a prominent and extremely active brokerage firm in Boston through much of our sample period) notes that in April 1803 subscription lists for the Boston Bank were closed after the sale of more than $3 million to 1,157 subscribers and 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 prices are quoted for industrial securities before 1835 when the Boston stock market was 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 (the average date of incorporation/commenced operation was September 1826). Consequently, there was some historical record and information available about the companies which were traded on the exchange.

The market both before and for a long time after its formal creation, however, 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 security was traded. On the other hand, there were days during the Civil War when business was described as "*enormous*" (Barron and Martin, 1893, unpaged, emphasis in original).

The thinness and narrowness of the market inevitably raises questions about the prices that emerged. Indeed, 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).

At the same time, however, the organization of the market minimized the impact of this structure 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 one on which each security was traded sequentially in each of the twice-daily sessions. The advantage of this over the more common continuous markets where any security can be traded any time that the exchange is open is that the full attention and liquidity of the market were focused on each security eligible to be traded on the market albeit for only two brief moments of time each day and ought to lead to efficient prices (see, for example, Casey, 1992; Satterthwaite and Williams, 1989). Moreover, reliance upon annual data may actually be an advantage in our attempt to isolate longer-term sectoral relationships that might otherwise be clouded by sharp and random variations that are typical of security prices sampled at high frequencies, although our use of only high and low prices in any year leaves open the possibility that our analysis deals primarily with outliers.

The thinness of the securities market is 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), less than 5 percent 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 provided that 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. Many had a par value of $1,000 compared with $1 today. Of the 16 industrials traded in 1835, for example, 13 had par values of $1,000; one had a par of $750 and two had pars of $500 (Martin, 1871, p. 64). The rationale behind the high par values is unclear though we believe that it reflects 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 1870), for example, had a par value of $100 while the Portsmouth Steam Mills which failed in 1865 had a par of just $50—and some companies (for example, Atlantic Cotton Mills and the Boston and Sandwich Glass Co.) occasionally lowered par values (Martin, 1871, 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 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 their authorized capital or had sought an inflated authorized capital to provide for further growth without having to modify their charter), stockholders, unlike today, were potentially liable for the 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 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 one's ownership of the stock. For example, in 1818 and again in 1822 the

Massachusetts legislature adopted provisions that held shareholders of record when a debt was incurred liable for those debts (Dodd, 1948, p. 1365). By the time the stock market was formally established, however, Massachusetts industrial stockholders finally enjoyed limited liability protection beginning in 1830 for special charters and continued in the General Incorporation Act of 1851 (Dodd, 1948, especially 1372-3).

From the first, the Boston stock market 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 the federal government obligations and a few other issues, notably Lake Superior copper mines, most securities tended to be local or regional in origin. This was particularly true of the 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 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 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).

II. The Performance of the Boston Stock Market

Joseph G. Martin's 1871 *Seventy-Three Years' History of the Boston Stock Market* contains a set of surprisingly detailed tables with firm-level records of high and low prices of actual trades, par values, and dividends in each calendar year for traded manufacturing firms, banks, insurance companies and railroads. The notes accompanying these tables contain additional information on stock dividends, assessments, splits, and capitalization levels. We use this data to compute summary indexes of annual price performance, dividend yields, and holding period 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.

Martin's various cautionary comments regarding the thinness of the market in industrials fails to convey a true sense of just how thin the market was. Before we began our search for higher frequency data, we had expected to find sales every few days in most stocks. This proved not to be the case. In fact, from the start of our study in 1835 until September 7, 1844, the *Boston Daily Advertiser* did not regularly report sales or prices of stocks traded at the Broker's Board, and those transactions in industrials that were reported (seldom with price included) took place at private auctions (conducted by brokerage firms such as that of Stephen Brown). Spot checking dates at random after 1844 suggests that on most days no industrials at all were traded over the Broker's Board and when trades did take place, few shares from even fewer firms changed hands. For example, on July 3, 1845 the only industrials traded on the board were 3 shares of the Lawrence Manufacturing Company which traded at 93 percent 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. On June 3, 1852, one share of Bay State Mills traded at 867 1/2 (*Boston Statesman*, June 5, 1852). This pattern was not atypical and seems to have persisted for many years. During 1854, for example, 41 industrials were quoted on the board but there were no recorded trades in the stock of eighteen of these companies and in 3 companies (Atlantic, Boott, and Tremont Mills) just one share in each was traded during the course of the year. The most actively traded stock during the year was the Lawrence

Machine Shop in which 1,643 shares (of the 20,000 par value $50 shares in the company) were traded, or about 8 percent of outstanding stock at prices ranging between $13/share and $28.75/share (*Boston Daily Advertiser*, January 8, 1855). Of 43 industrials listed in 1855, no trades were recorded for 13 (*Boston Daily Advertiser*, January 10, 1856) and of 44 industrial equity issues on the market in 1856, no trades were made on the board in 10 of the companies (*Boston Daily Advertiser*, January 13, 1857).

Upon encountering such sparse quotes, our first thought was that our initial source, the *Boston Evening Transcript*, was recording the trades made by just one particular broker. Cross checking listings in other sources such as the *Boston Statesman*, however, produced the same quotations (except for what we take to be typographical or transcription errors such as a "0" in place of a "6") for the same dates. Newspaper listings throughout our sample, however, imply that some trades took place outside the exchange. For example, on September 5, 1844 it was reported (*Boston Daily Advertiser*) that 4 shares of the Exeter Manufacturing Company (not quoted on the Board) "will be sold at a bargain to settle a concern" while two days later the paper reported 5 shares of Palmer Manufacturing Company and 4 shares of Thorndike Manufacturing Company were sold also "to settle a concern." We believe that it is this type of trading outside the exchange that allowed Martin to report monthly prices for industrials near the start of each year from 1854 through 1856 in the *Boston Daily Advertiser* despite the fact that no shares were traded at the Board during the year.

Railroad stocks and bonds, mining shares, land companies and bank and insurance stocks were traded more frequently. Indeed some of the listings show each trade as well as the number of shares being traded. Thus, for example, at the first board on April 19, 1849, 50 shares of the Vermont Central Railroad were traded at 54 3/4 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 where the market determines a single price for all shares in a particular stock being traded on a particular board. Moreover, newspaper listings suggest that brokers (for example, Boston Exchange founding member P. P. F. DeGrand) did not necessarily conduct all their business in listed companies through the board despite exchange rules requiring them to do so (*Boston Daily Advertiser*, September 7, 1844; Barron and Martin, 1893, unpaged).

Based upon our survey of Boston stock market listings available to us at this point, we no longer think that the search for high frequency (i.e. daily or weekly) stock trading data on industrials in Boston during much of this period is particularly worthwhile or cost effective since there is no point in collecting higher frequency data for bank stocks if we must accept much lower frequency data for industrials. We recognize that this imposes limits upon the analysis we can perform. At the same time, however, we have recently located Martin's worksheets showing the quarterly high and low prices along with the opening price in each quarter from 1855 onwards for securities traded on the Boston exchange. We propose using the available year-end observations simply to verify our findings based upon the annual high-low data in due course.

Figures Ia and Ib show those years over the 1835-1869 period in which either a price or dividend is available for the traded banking and manufacturing firms. They thus define the universe of our study. Graphs of the resulting indexes and some discussion of their construction follow—the actual series and the number of firms included in each calculation are presented in the Appendix.

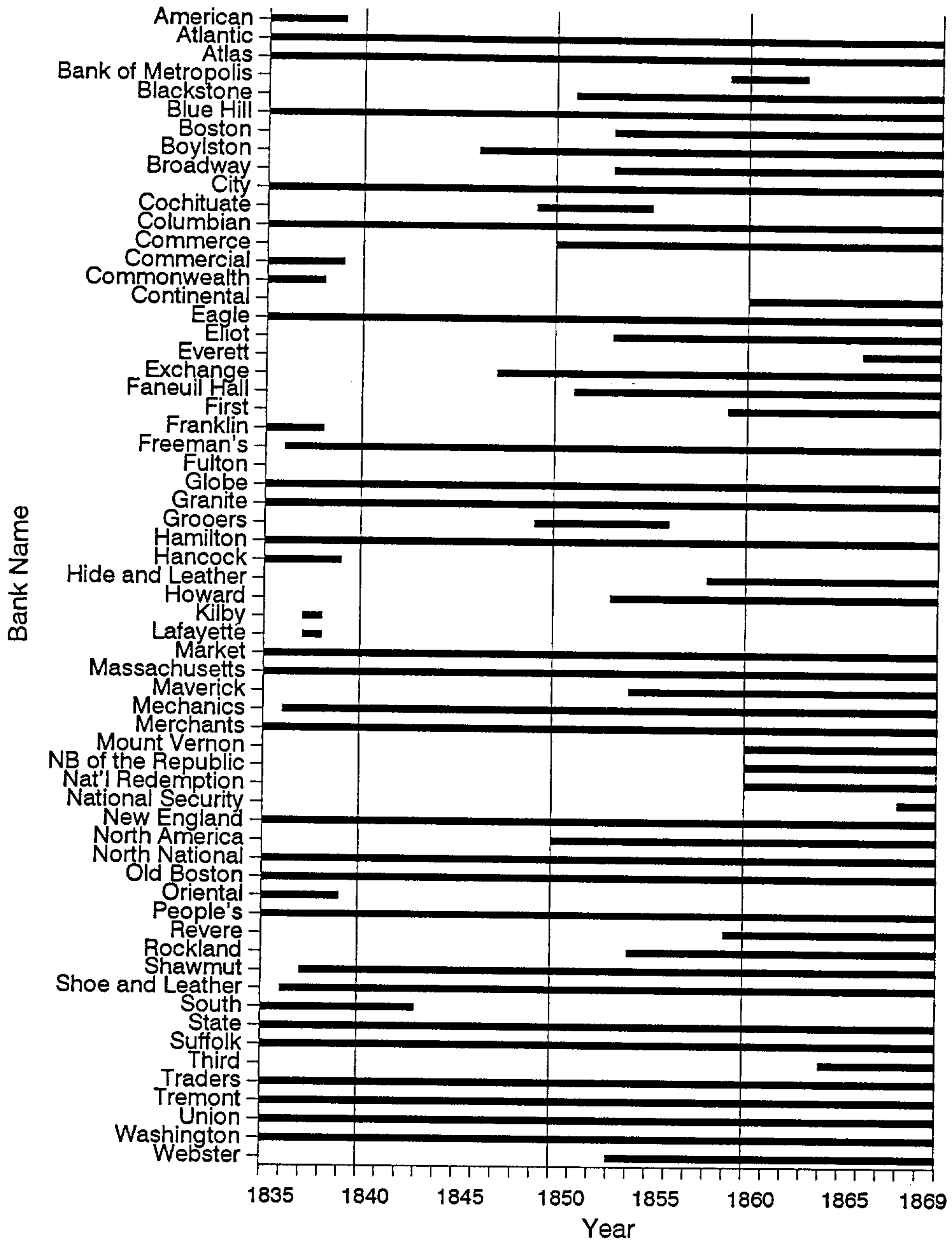

Figure Ia
Annual Price/Dividend Coverage of Martin's Data for Traded Bank Stocks

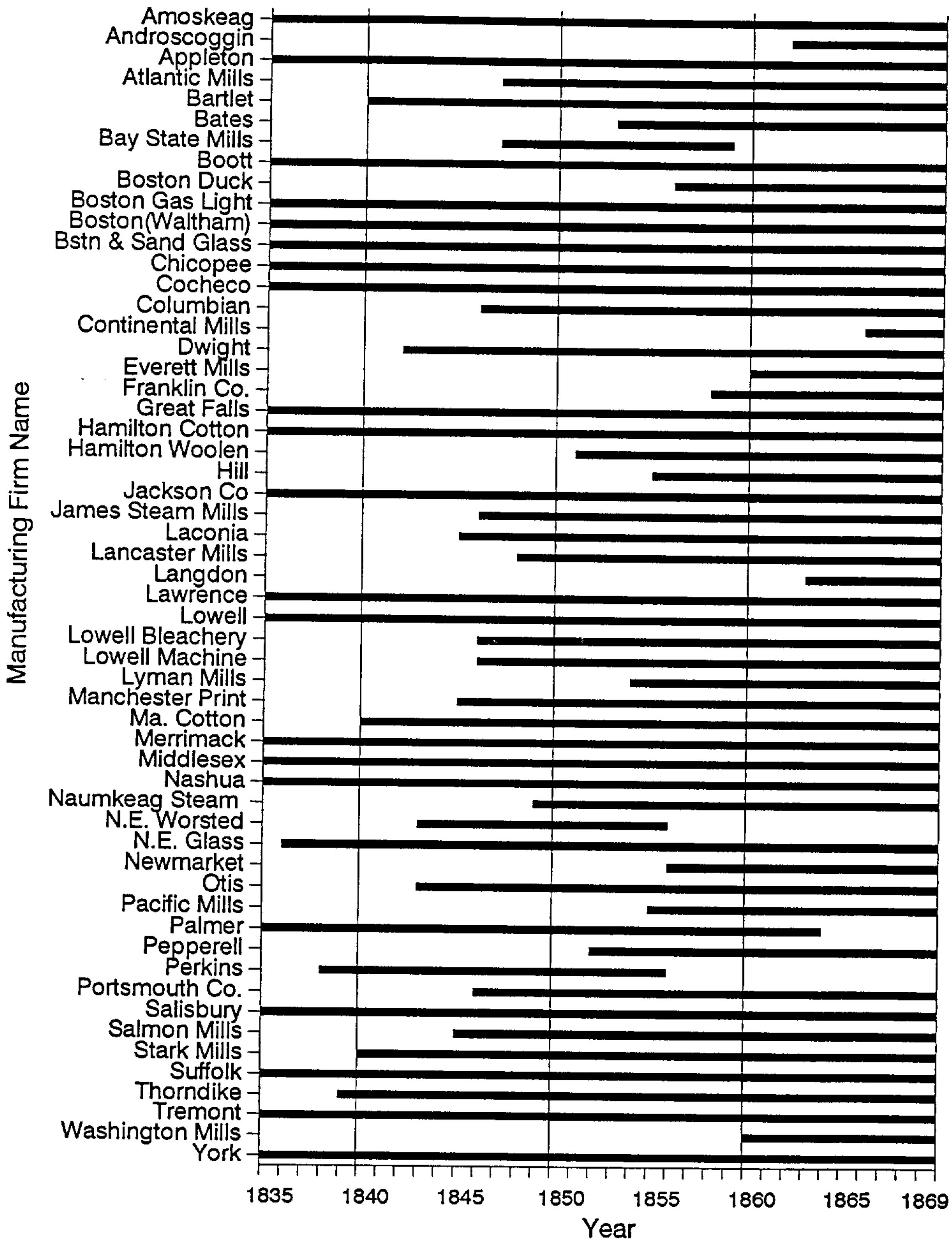

Figure Ib
Annual Price/Dividend Coverage of Martin's Data for Traded Manufacturing Stocks

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

A. Dividends

In this section, we present measures of income performance for traded banking and manufacturing equities. Figures IIa and IIb include sectoral dividends (in both cash and stock) as a percent of par value with firms weighted both equally and by their contributions to total sector capitalization. The series include regular, extra and stock dividends. Assessments are treated as negative dividends. A par value and either a current or previous dividend declaration are required for inclusion of a firm in the equally-weighted series in any given year. A capitalization is additionally needed for the capital-weighted series. Since all firms that declared dividends had capitalization data available, the number of firms included in the series for each year is identical under either weighting scheme. The number of manufacturing firms increases rapidly from 19 to 46 between 1835 and 1854, and then rises gradually to 51 by 1865. The banking series include 19 banks for 1835, remain at 24 between 1837 and 1845, and then rise steadily to 48 by 1869.

Banks followed a fairly smooth dividend policy over the first thirty years of the sample (Figure IIa), with annual payments ranging between six and eight percent of par. 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,

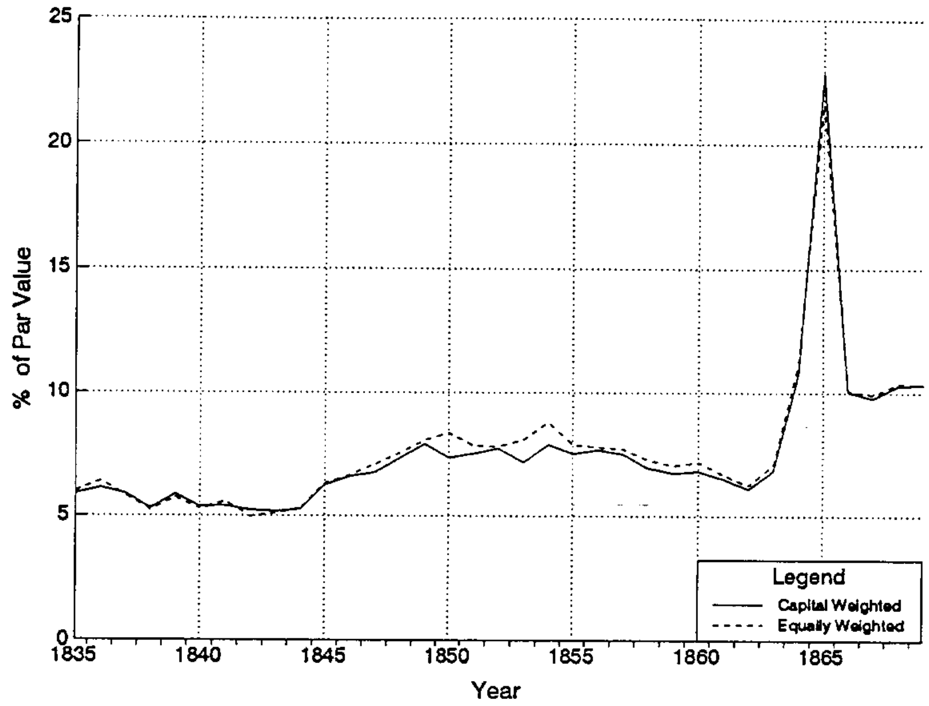

Figure IIa
Banking Dividends as Percent of Par Value

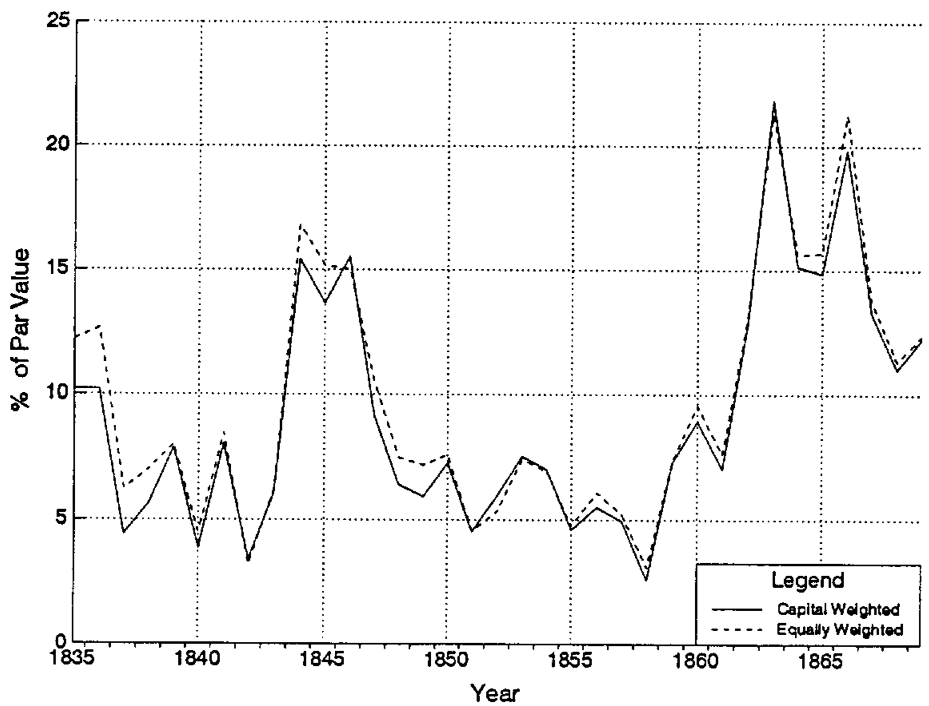

Figure IIb
Manufacturing Dividends as Percent of Par Value

p.53).[1] In fact, thirteen banks declared dividends in excess of twenty-five percent in 1865, with the Suffolk bank even declaring an extra dividend of 128 percent on January 10![2] Overall, dividends as a percent of par averaged 7.56% for banks using the capital-weighted series with a standard deviation of 3.03%. With 1865 eliminated, these statistics fall to 7.11% and 1.53%. Even after adjusting for inflation, average dividends remain substantial at 7.22% using the price index from the Bureau of Labor Statistics (BLS) and 6.65% using the Brady, David and Solar (BDS) index of consumer prices.[3] [4] The corresponding real standard deviations of 8.16% and 8.19% are larger than the nominal ones, however. This difference might be expected given the unpredictable behavior of prices over our sample, and lends support to the notion that agents based investment decisions primarily on nominal rather than real considerations.

Dividends as a percent of par for manufacturing firms increased sharply to over fifteen percent between 1843 and 1846 in the recovery from the 1837-43 depression (Figure IIb) before settling back to around five percent throughout the 1850s. They then rose substantially after

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[1] 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 is puzzling. However, we suspect that the paradox might be explained by a decision by the banks concerned 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.

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

[3] The BLS prices (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, it may reflect New England prices over 1835-1851 more sharply than the BLS series.

[4] 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. This method is also used by Snowden (1990).

1862 whether in real or nominal terms. The mean dividend of 9.15% and standard deviation of 4.66% for the capital-weighted series are considerably larger than those of banks, yet the price-adjusted variability is actually less for manufacturing firms.[5] While there is little variation between the equal and capital-weighted series, it would also appear that larger manufacturing firms paid lower dividends on average than smaller ones, particularly over the 1835-40 period.[6]

To the extent that par values adjusted in a step-like fashion for the manufacturing firms considered here, dividends as a percent of par may not reflect the true income yields that a typical shareholder could expect to receive. For this reason, we also calculate dividends as a percent of the reported low stock prices for each year with firms weighted both equally and by share of sector capitalization in Figures IIc and IId. These dividend yields closely resemble the dividends as a percent of par, although the peak for manufacturing firms in 1866 is not nearly as sharp.[7] Any discrepancies between the equal and capital-weighted series manifested in the par value dividends virtually vanish for dividend yields. This suggests less variability in the prices of larger manufacturing firms as well as a tendency for larger firms to adjust par to reflect share value more frequently than smaller firms.[8] Using the capital-weighted dividend yields,

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[5] In real terms, the mean and standard deviation of the manufacturing dividends are 8.69% and 7.65% using the BLS price index and 8.09% and 7.50% using BDS prices.

[6] Profit estimates by Bateman and Weiss (1981), Atack, Bateman and Weiss (1982), and Atack and Bateman (1992; 1994) consistently find that larger firms earned lower returns on capital than smaller firms though the variance for larger firms was also much smaller.

[7] A firm must have both a low price and dividend reported in either the current year or a previous year to be included in the dividend yields. Thus, these series include fewer firms than the dividends as a percent of par due to the omission of dividend observations that are not accompanied by prices. This eliminates seven manufacturing firms on average in each year. There is very little discrepancy in the coverages for banks.

[8] Again, consistent with the findings of Bateman and Weiss (1981), Atack, Bateman and Weiss (1982), and Atack and Bateman (1992; 1994).

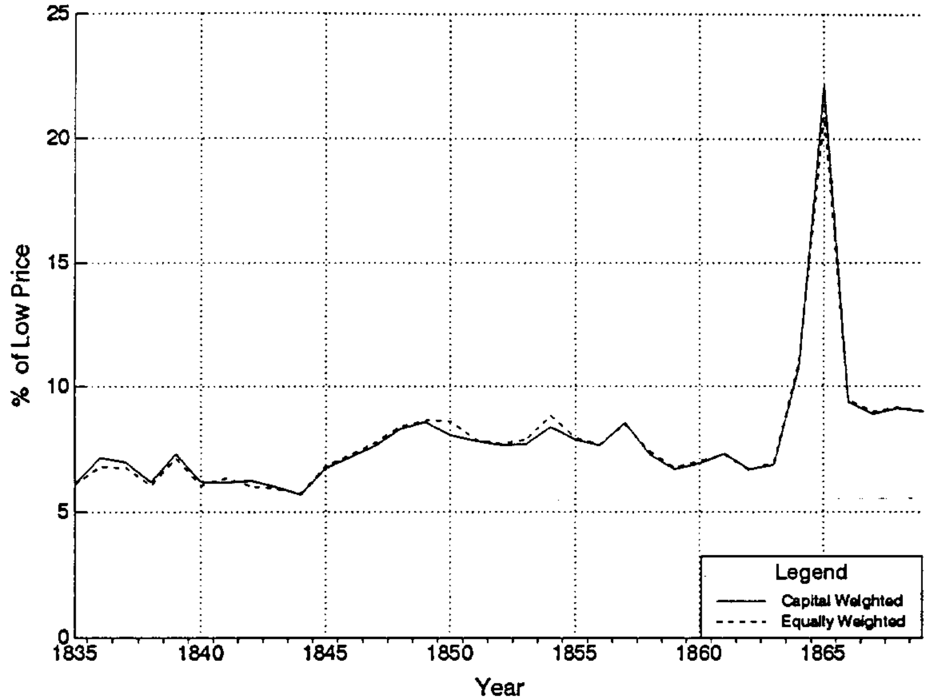

Figure IIc
Banking Dividend Yields

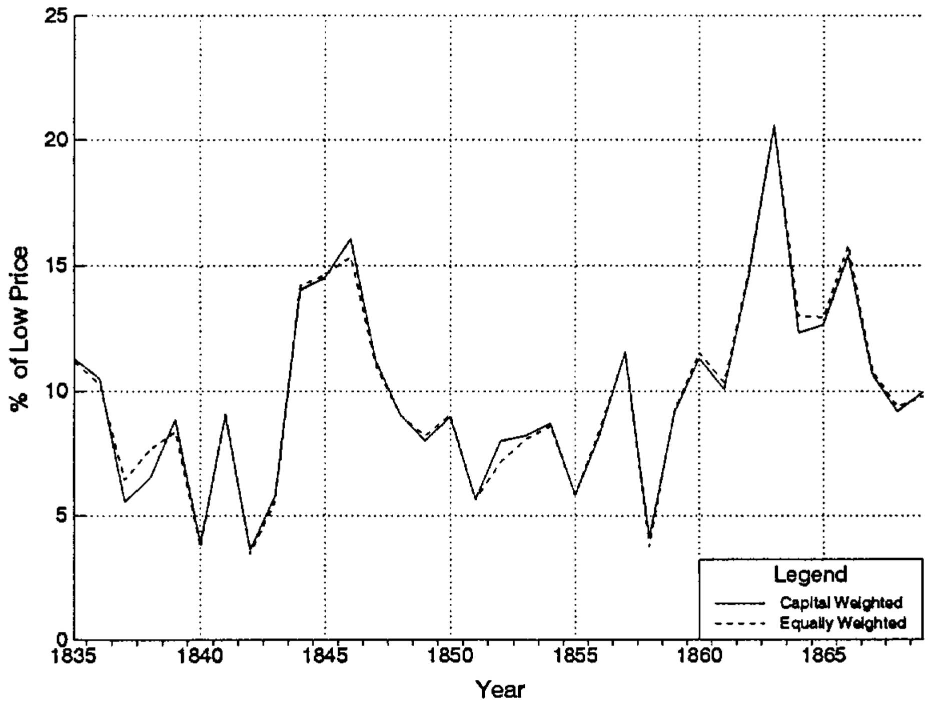

Figure IId
Manufacturing Dividend Yields

the mean and standard deviation for banking firms are 7.92% and 2.69%, while for manufacturing firms the respective figures are 9.82% and 3.71%, each larger in size and less variable than the par value dividends. This suggests that changes in prices that were below par on average often varied directly with dividends to produce slightly smoother yields.

The plots also indicate that dividends were an important means of distributing earnings and keeping prices close to par for both banks and manufacturing firms. Given the agency problems arising from informational asymmetries that are generally associated with nineteenth 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 showed relatively little short-term movement but clear trending behavior (Figure IIIb below), contrasts sharply with what appears to be a widely-held belief that mid-nineteenth century U.S. investors valued 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, 231-2; Graham and Dodd, 1934, p. 342).

B. Price Indexes

Modern indexes of stock market price performance vary considerably in construction. For example, the Dow Jones Industrial Average (DJIA) is based on the average price of thirty industrial equities after adjusting for splits and changes in the firms that comprise the index. If the included firms were to remain constant, this "price weighted" index would track the cumulative wealth of an investor who purchased 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 percent change in the price of the stocks in the index, and uses this average to adjust the index value from the previous day. Such an "equally-weighted" index reflects the wealth that an agent would obtain by adjusting his portfolio daily to place an equal amount in each stock. The Standard and Poor's 500 index, on the other hand, is based on the total market value (price multiplied by number of shares outstanding) of 500 firms listed on the major U.S. exchanges.

Our reluctance to keep the number of firms in an index constant (as in the DJIA or S&P 500) by assigning criteria for listing and de-listing limits the indexes that we can construct to those of the "Value-Line" variety, although we compute average percent price changes on an annual basis by weighting firms both equally and by the share of each firm's book capital to total sector capitalization. These indexes have the advantage of easily permitting the number of included firms to shrink and expand with market conditions.

Since the low price of a stock in any calendar year is more likely to reflect an ex-dividend valuation than a high price, we believe that indexes based on low prices best capture fluctuations in capital gains among diversified shareholders. Indeed, a number of lows are so flagged by Martin. Nevertheless, we use low prices, high prices and their averages to construct separate indexes of market performance. We adjust for splits by ignoring 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. To be included in the capital-weighted index for any given year, a stock must have both a price and book capitalization—only a price is needed for inclusion in the equally-weighted index. This excludes a small number of manufacturing firms that have only dividends available, especially in the earlier years.

Figures IIIa and IIIb present the price indexes for the banking and manufacturing sectors.

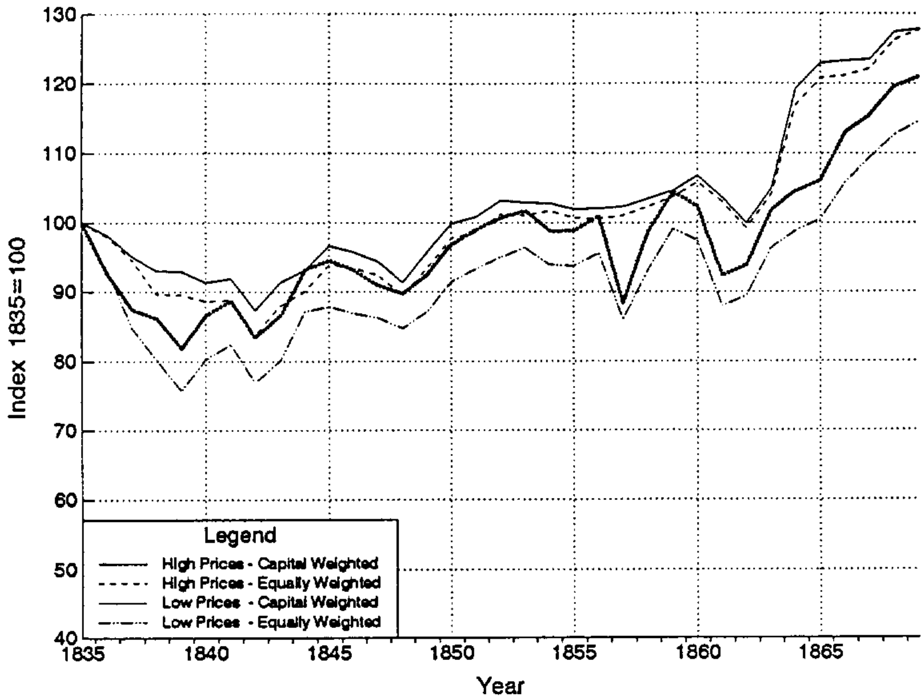

Figure IIIa
"Value-Line" Type Price Indexes For Traded Bank Stocks

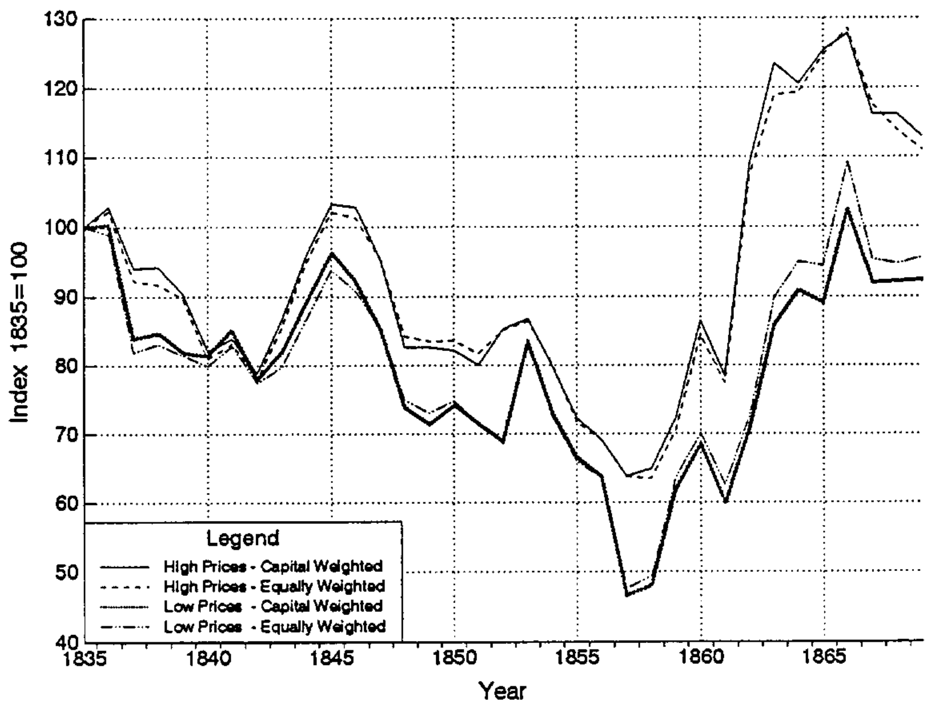

Figure IIIb
"Value-Line" Type Indexes for Traded Manufacturing Stocks

As noted earlier, only 16 manufacturing firms have price data available in 1835, but this number increases gradually (with the exception of a sharp increase in 1845) to reach a plateau of 48 by 1866. The banking index begins with 27 firms. The downturn of 1837 was accompanied by bank closings that reduced the number to 24 by 1842. Thereafter, coverage increases rapidly to reach a total of 48 banks by 1869. Since a very small number of firms have only a low price available in the first year of listing, the coverages of the equivalent high price indexes are slightly less in some years.

There is little discrepancy between the capital-weighted and equally-weighted indexes for the manufacturing sector, and the series using low prices exhibit fluctuations that are quite similar to those of indexes constructed with high prices prior to 1860. Thereafter, the gaps between the low and high price series are much wider. 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 the poor performances 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. Thereafter, the gap remains fairly constant.

Bank stock prices gradually rose after 1840, with the low price, capital-weighted index enjoying a mean annual increase of 0.68% with a standard deviation of 5.10%. The price gains were usually even larger in real terms.[9] Coupled with dividend data that exhibit peaks and

[9] 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

troughs that correspond closely with the 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.[10]

Overall, the price performance of manufacturing firms was anemic before 1855 and 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.

C. Total Returns

While the series presented in Figures II and III offer metrics with 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 for each firm, and then dividing by price. The resulting total returns are then weighted both equally and by capitalization. As noted earlier, we use low prices since they are more likely to reflect ex-dividend valuations than high prices and thus generate more conservative estimates of overall equity performance.

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and -0.32% and 8.90% 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 three 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%.

[10] This observation is consistent with the findings of Fenstermaker et al. (1988).

The uncertain timing of the reported low prices in most years requires the adoption of processing rules to approximate an actual total return (i.e., the return from holding a stock for a year). Here, we construct the total return as

$$TR_t = (PL_{t+1} - PL_t + D_t) / PL_t \ , \tag{1}$$

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) uses this same procedure (but with quarterly data). An alternative formula that is correct if trading prices are observed at the end of each year is

$$TR_t = (PL_t - PL_{t-1} + D_t) / PL_{t-1} \ . \tag{2}$$

Since the timing of the observations is unknown, the choice of computation technique might appear arbitrary; however, equation (1) appears most appropriate for our empirical work (in Section IV) that relates changes in price indexes and total returns.[11] To be included in the total return series for any given year, a firm must have a low price available for both the current and following year.

The annual returns are presented in Figures IVa and IVb. The bank returns are considerably smaller and less variable than the manufacturing returns, with bank stocks earning a capital-weighted mean of 8.52% annually with standard deviation of 6.41% as opposed to 9.66% and 12.03% for manufacturing stocks. After adjusting for changes in the price level,

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[11] This is because the lagged changes in total returns as a group include all possible information about price appreciation in previous years, rather than possibly eliminating valid past information from the first lag. With annual data in a dynamic regression setting, loss of this information could lead to misleading inferences of statistical causality. Our use of equation (1) does, however, admit the possibility of simultaneity problems. These issues are addressed directly in section IV.D.

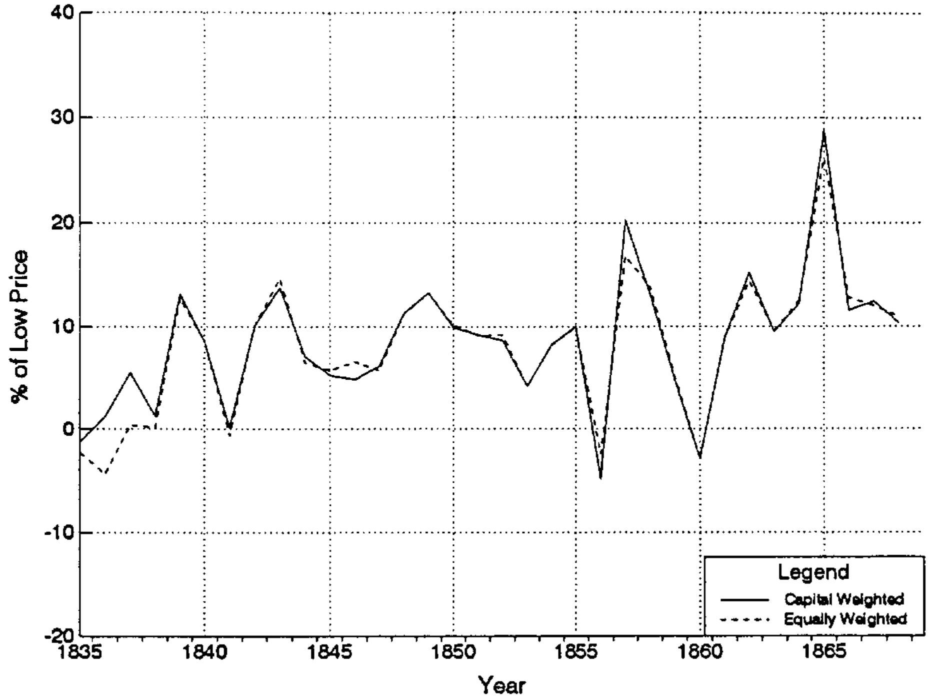

Figure IVa
Annual Holding Returns for Traded Bank Stocks

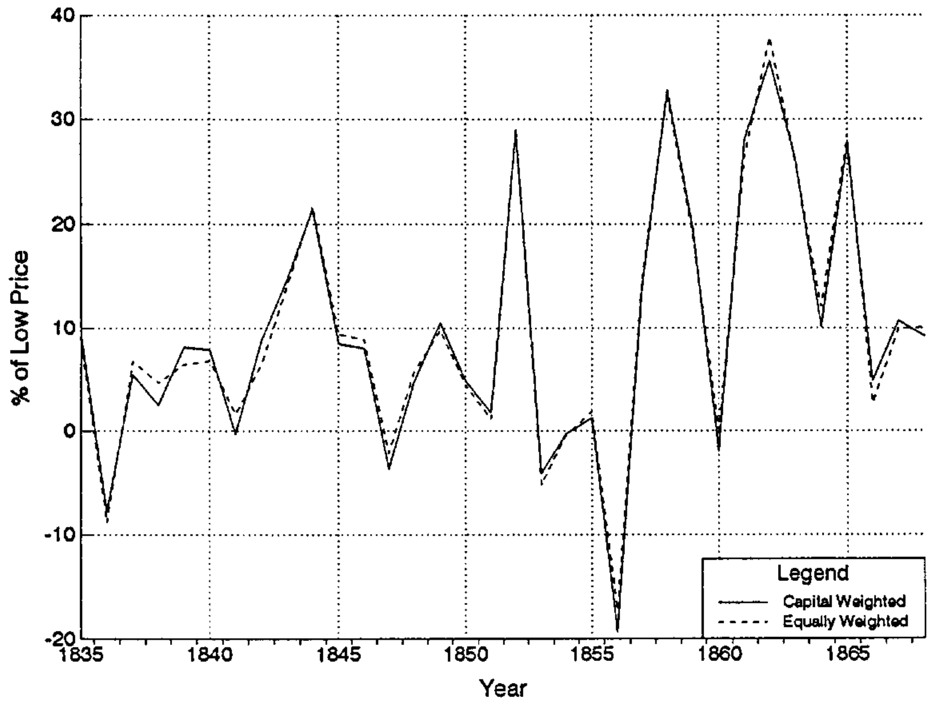

Figure IVb
Annual Holding Returns for Traded Manufacturing Stocks

however, bank returns are only slightly less variable than manufacturing returns.[12] The 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 returns were lower and much more variable than the dividend yields, implying negative comovement among the components. Peaks in the nominal banking returns also precede manufacturing peaks in 1844 and 1858, while upturns in the nominal banking series precede those for manufacturing in 1847, 1851, and 1863.

D. Interest Rates

In the absence of readily available sources of longer-term financing (through, for example, stock issues or long-term bank loans), nineteenth century businesses relied heavily upon short-term revolving trade credit 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. It plays a key role in Davis's (1965) story of the emergence of a national market after the Civil War but the commercial paper market 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 Merchant Magazine. Homer and Sylla (1995), for example, combine Erastus Bigelow's estimates of Boston first class three to six month paper between 1835 and 1856 with New York

[12] The standard deviation of real capital-weighted total bank returns rises to 10.26% using BLS prices and 10.43% using BDS prices, while the variability of real returns for manufacturing firms falls by less than 1%. The average of the real total returns fall to 8.01% (BLS) and 7.45% (BDS) for bank stocks and 8.81% (BLS) and 8.25% (BDS) for industrials.

rates on 60 to 90 day choice paper thereafter (both series coming from Macaulay (1938)) 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 months, bankable paper." Both are similar though not identical (Figure V).

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 bounds than are common today. For example, in 1837—a crisis year—rates opened at 16 percent, advanced to 20, and receded to 13 in January (Martin, 1871, p. 37) before rising again and eventually reaching 32 percent in May when banks suspended payment in specie and ending the year at 10 percent. In contrast, in 1844 rates opened at 4 percent, rose to 5 percent in March and remained at that level for the rest of the year. Certainly the data are broadly consistent with the dating of the early 19th century business cycle (see Figure V).

III. 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 present.[13] Cyclical fluctuations were certainly present at earlier dates (for example, following the end of the Napoleonic Wars in Europe) but the dating is less exact. According to Burns and Mitchell (1946, p. 78), the calendar year reference dates for the business cycle are 1836, 1839, 1845, 1847, 1853, 1856, 1860, 1864 and 1869 for 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

[13] See for example the NBER web site at http://www.nber.org.

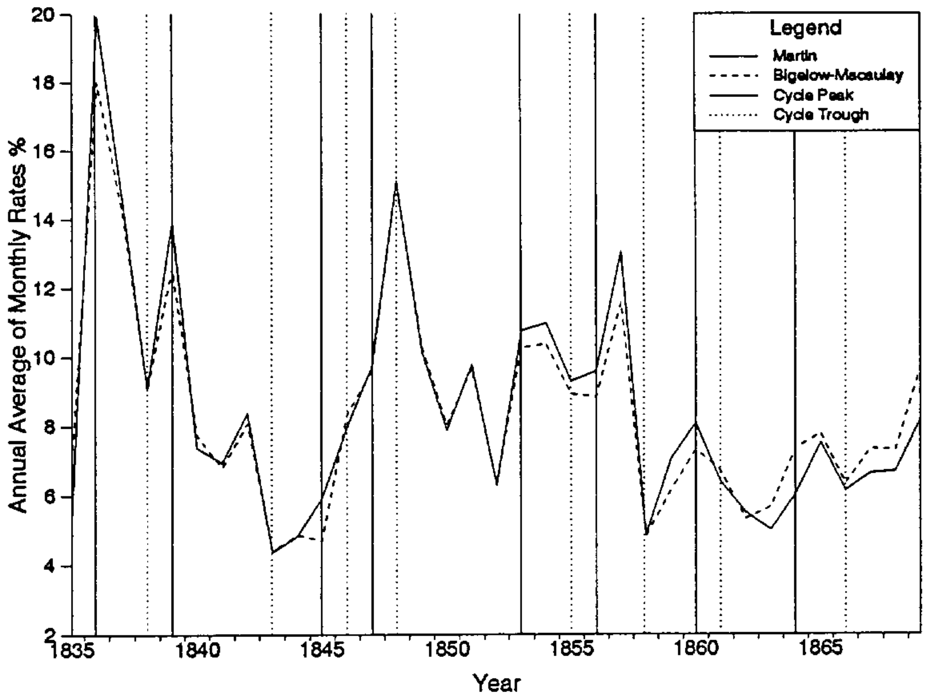

Figure V
Interest Rates on Short-Term Bankable Paper
With Cycle Turning Points From Burns and Mitchell (1946)

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). An obvious question given our three separate 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 both with respect to price and dividends and 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 percent. Rates rose throughout 1836 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 two 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 three others quit (Commercial, Hamilton 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 1854/55 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.

IV. Empirical Findings

In this section, we develop and estimate VAR models to examine relationships between the banking and manufacturing sectors. To obtain standard F-distributed block exclusion tests from a VAR, the non-stationary variables are usually differenced unless the system is cointegrated. Consequently, we first consider the stationarity properties of the lending rate and our performance measures for traded bank and manufacturing equities. Lagged cross-correlations among stationary transformations of these variables are then used to identify potential dynamic relationships for further examination in three-variable VARs. After determining if the VARs are cointegrated, the statistical exogeneity properties of the system variables are explored using Granger-causality tests. Finally, we discuss possible simultaneity issues that arise from the timing of our observations.

A. Stationarity Tests

We begin the empirical analysis by evaluating the stationarity of lending rates and the value-weighted, low-price stock market performance series with Augmented Dickey-Fuller (ADF) tests. Table I reports the results for two different specifications. The specification with only a constant term tests for a unit root against a stationary alternative with fixed mean, while the specification with both a constant and a linear time trend tests for a stochastic trend against an alternative of trend stationarity. Since data plots often leave the appropriate assumption for the data generating process unclear, we treat a series as non-stationary if we do not reject the null hypothesis with either specification. Only when the results conflict do we turn to plots of the data to determine which assumption appears the most plausible. Two lags of the dependent

TABLE I
Augmented Dickey-Fuller (ADF) Statistics of Value-Weighted Performance Aggregates For Traded Firms 1835-1869

Variable	Constant only Level	Constant only 1st Differ	Constant and Trend Level	Constant and Trend 1st Differ
Bank Price Index (BPL)	0.31	-3.94**	-1.89	-4.17**
Bank Dividend Yield (BDY)	-2.48	-4.82**	-3.44	-4.73**
Bank Total Return (BTR)	-2.89*	-5.38**	-3.44	-5.26**
Manufacturing Price Index (MPL)	-1.53	-2.87*	-1.32	-2.89
Manufacturing Dividend Yield (MDY)	-2.03	-3.24**	-2.22	-3.16*
Manufacturing Total Return (MTR)	-2.55	-5.03**	-2.83	-4.96**
Lending Rate (LINT)	-2.77*	-2.98**	-2.49	-3.01

The ADF regressions include two lags of the dependent variable. The first difference columns for the price indexes (BPL and MPL) use annual percentage growth rates. * and ** denote rejection of the unit root hypothesis at the 10% and 5% levels respectively, using finite sample critical values from table 8.5.2 of Fuller (1976).

variable are used in the ADF tests.[14]

The null hypothesis of a unit root cannot be rejected at the 5% level for any of the equity performance variables in levels under either specification. At the 10% level we reject with constant only for the total returns of bank stocks (BTR), but a gradual upward trend in the BTR

[14] The Akaike and Schwartz criteria select either one or two lags in all cases. We use two lags in each regression, however, since there is a tendency for ADF tests to over-reject the null in small samples when these criteria are employed and the loss of power from the inclusion of an additional (and possibly unnecessary) lag is generally small (Schwert, 1989).

series (Figure IVa) suggests that the constant and trend specification is perhaps most appropriate. This survives the ADF test. The tests with only a constant reject the null for all of the equity performance series in first differences at the 10% level or less, though a rejection is not obtained with constant and trend for differences of the manufacturing price index (MPL). Since differences of the MPL index do not tend to increase over the sample, in this case the constant-only specification is most appropriate.

The stationarity properties of the lending rate are unclear in our sample. With the constant-only specification we reject the null at the 10% level while we cannot reject with the constant and trend specification. Although it is reasonable to model interest rates over the long term as a mean reverting process, it is important for us here to evaluate the stationarity properties of the lending rate in our finite sample. Since there appears to be a downward trend in the lending rate (Figure V) and the rejection for the constant-only specification is at the 10% level only, we have chosen to treat the lending rate as non-stationary for statistical purposes.

Overall, the ADF tests suggest that non-stationarity is at least plausible for the levels of all variables considered. Given that spurious results may arise in regressions that use non-stationary variables inappropriately, we thus prefer to make non-stationarity our operating assumption. One reason to be cautious in interpreting our results, however, lies in the poor power properties of ADF tests when the data contain structural breaks, which Figures IIIb and V suggest may be present in manufacturing prices and commercial paper rates. Though techniques for implementing structural breaks in unit root tests are well-established (Perron 1989; Banerjee, Lumsdaine and Stock, 1992), their reliance on either knowing the breaks "a priori" or using severely shortened subsamples of the data make such techniques impractical for our exploratory analysis with thirty-five annual observations.[15]

B. Cross-Correlations

After transforming the price indexes into annual growth rates and taking first differences of the lending rate, dividend yields and total returns to generate stationary series, we compute cross-correlations between each series and two lags of the others. The results appear in Table II, with p-values of Ljung-Box Q statistics in parentheses for a null hypothesis that both lags of the row variable have jointly no correlation with the column variable. The correlations that are significant at the 5% level (in boldface) provide some indication of the more important bivariate relationships that may have operated in Boston financial markets over the 1835-1869 period.

Growth in the price index for bank equities is negatively correlated with two-year ahead movements in the price performance and dividend yields of manufacturing stocks. This is consistent with the a tendency for bank stock prices to rally prior to business cycle peaks. Our finding of strong positive correlation between lags of the bank price index and lending rates might also reflect upward pressures on interest rates that are typical of maturing expansions. In contrast, lagged changes in total banking returns exhibit a negative correlation with changes in lending rates. This suggests that interest rates were possibly quite sensitive to both actual earnings and future prospects for bank equities, and that declines in price performance may have prompted banks to tighten credit. A positive correlation between total bank returns and future manufacturing price performance also suggests that financial stringency may have affected the real sector through both supply (credit quantity) and demand (interest rate) channels. In

[15] Nevertheless, if we choose a break in 1857 for manufacturing prices and 1847 for commercial paper rates, the Perron (1989) technique still generates unit root test statistics that do not reject the null of non-stationarity.

TABLE II
Lagged Cross-Correlations For Value-Weighted Market Performance Measures

	BPL	BDY	BTR	MPL	MDY	MTR	LINT
BPL_{-1}	.016	.139	-.128	.220	.226	-.364	.443
BPL_{-2}	-.274	.166	.233	-.319	-.392	.132	.045
Q(1-2)	(.236)	(.422)	(.268)	(.058)	**(.023)**	(.066)	**(.025)**
BDY_{-1}	.088	-.303	-.131	.173	.127	-.113	-.103
BDY_{-2}	.056	-.191	-.091	-.019	-.011	-.044	-.006
Q(1-2)	(.821)	(.091)	(.630)	(.580)	(.739)	(.767)	(.821)
BTR_{-1}	.594	-.331	-.391	.326	-.029	-.041	-.476
BTR_{-2}	.157	-.086	-.239	.281	.341	-.300	.214
Q(1-2)	**(.001)**	(.120)	**(.022)**	**(.034)**	(.113)	(.182)	**(.007)**
MPL_{-1}	-.187	.254	.053	.071	.072	-.198	.295
MPL_{-2}	-.212	.184	.266	-.220	-.326	.181	-.106
Q(1-2)	(.223)	(.159)	(.255)	(.360)	(.119)	(.268)	(.161)
MDY_{-1}	-.097	-.149	.011	-.023	-.299	-.140	.062
MDY_{-2}	.022	.461	.191	-.102	-.181	.233	-.080
Q(1-2)	(.838)	**(.011)**	(.505)	(.817)	(.102)	(.254)	(.823)
MTR_{-1}	.614	-.370	-.508	.713	.179	-.352	-.236
MTR_{-2}	.025	.126	-.111	.201	.307	-.243	.311
Q(1-2)	**(.001)**	(.063)	**(.008)**	**(.000)**	(.097)	**(.036)**	(.061)
$LINT_{-1}$	-.174	-.009	.180	-.454	-.473	.302	-.326
$LINT_{-2}$	.110	-.118	-.191	.093	.151	-.042	-.190
Q(1-2)	(.453)	(.765)	(.283)	**(.019)**	**(.010)**	(.186)	(.070)

The table presents cross-correlations between the variables identified in the columns and the lagged variables listed in the left column. Variable acronyms are as defined in Table I, except that the price indexes (BPL and MPL) are now expressed as annual percentage growth rates and the other variables have been first differenced. The third row of each group reports the significance level of the Ljung-Box Q statistic for the hypothesis that the cross-correlations at the first and second lag are jointly zero. Instances of significance at the 5% level or less are denoted in boldface.

addition, the observed positive correlations between lagged changes in manufacturing total returns and both the price and total return performance of traded bank equities suggest that strong performance in the manufacturing sector generated demand for additional financial services from a banking sector that was able to both accommodate the demand and maintain profitability.

C. Selection and Estimation of Vector Autoregressive Models

The lagged cross-correlations must be interpreted cautiously with regard to economic and statistical causality since they could well be driven by omitted variables (such as a lag of the dependent variable). Thus, the findings are used to specify reduced forms which, given the available data, may more precisely capture dynamic timing relationships among our measures of equity performance.

In particular, Table II indicates that lending rates and measures of price and earnings performance of bank equities are potentially important correlates with manufacturing prices, and that lending rates and manufacturing prices are not strongly correlated with bank prices. We proceed to construct a pair of three-variable VARs that summarize these findings. Model 1 is given by

$$MPL_t = \mu_1 + \sum_{i=1}^{2} \alpha_{1,i} MPL_{t-i} + \sum_{i=1}^{2} \beta_{1,i} BTR_{t-i} + \sum_{i=1}^{2} \gamma_{1,i} LINT_{t-i} + \epsilon_{1,t}$$

$$BTR_t = \mu_2 + \sum_{i=1}^{2} \alpha_{2,i} MPL_{t-i} + \sum_{i=1}^{2} \beta_{2,i} BTR_{t-i} + \sum_{i=1}^{2} \gamma_{2,i} LINT_{t-i} + \epsilon_{2,t}$$

$$LINT_t = \mu_3 + \sum_{i=1}^{2} \alpha_{3,i} MPL_{t-i} + \sum_{i=1}^{2} \beta_{3,i} BTR_{t-i} + \sum_{i=1}^{2} \gamma_{3,i} LINT_{t-i} + \epsilon_{3,t} \qquad (3a,b,c)$$

where MPL is the annual percentage growth of the manufacturing price index, BTR is the first difference of total banking returns, and LINT is the change in the lending rate. Model 2, which allows for a role of manufacturing sector returns in bank price performance, is given by

$$BPL_t = \mu_1 + \sum_{i=1}^{2} \alpha_{1,i} BPL_{t-i} + \sum_{i=1}^{2} \beta_{1,i} MTR_{t-i} + \sum_{i=1}^{2} \gamma_{1,i} LINT_{t-i} + \epsilon_{1,t}$$

$$MTR_t = \mu_2 + \sum_{i=1}^{2} \alpha_{2,i} BPL_{t-i} + \sum_{i=1}^{2} \beta_{2,i} MTR_{t-i} + \sum_{i=1}^{2} \gamma_{2,i} LINT_{t-i} + \epsilon_{2,t}$$

$$LINT_t = \mu_3 + \sum_{i=1}^{2} \alpha_{3,i} BPL_{t-i} + \sum_{i=1}^{2} \beta_{3,i} MTR_{t-i} + \sum_{i=1}^{2} \gamma_{3,i} LINT_{t-i} + \epsilon_{3,t} \qquad \text{(4a,b,c)}$$

where BPL is the annual percentage growth in the bank stock price index and MTR is the first difference of total returns in the manufacturing sector. We use growth rates or first differences of the data in these specifications because there is no strong evidence that the levels variables in either model are cointegrated.[16] 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.

We evaluate Granger-causal relationships in each system by computing F tests for the null hypothesis that the coefficients on the lags of a given variable in any single equation are jointly zero. Rejection of the null implies that past realizations of the excluded variable contribute information to the system that is significant in explaining fluctuations in the dependent variable beyond the information contained in its own lags and those of the other variables. Such an influence is evidence of statistical "causality," although economic causality is predicated on

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[16] We check for cointegration in each model using the Johansen (1991) test with a constant. The maximum eigenvalue test is unable to reject the null hypothesis of no cointegration at the 10% level for either model. The importance of these tests is shown by Sims, Stock and Watson (1990) who find that cointegrated tri-variate VARs need not be differenced prior to constructing block exclusion tests. In fact, they show that the use of differenced data in a cointegrated system may filter important information about long-run relationships from the VARs.

As a check for robustness, we therefore imposed the cointegrating relationships on Models 1 and 2 and estimated the VARs in levels. Our qualitative findings were unchanged.

inclusion in the specification of the full information set available to economic agents at time t. These conditions cannot be met in any finite regression setting. Consequently, it is important to view the results of the Granger-causality tests as indicative of the robustness of some of the cross-correlations to the addition of both more interesting dynamics and additional variables.

Table III reports estimates for Models 1 and 2. Changes in bank stock returns Granger-cause growth in the manufacturing price index at the 1% level, with positive coefficients on the lags of bank returns. They Granger-cause changes in lending rates at the 8% level with negative coefficients. Changes in lending rates also Granger-cause growth in the manufacturing price index at the 1% level with negative coefficients, but do not Granger-cause changes in banking total returns. In addition, the growth rate of the manufacturing index causes neither interest rates nor banking returns. These results imply an impulse 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 a feedback from manufacturing prices to the other variables suggests that the posited mechanism reflects the dominant causal direction.

Model 2 reverses the roles of the manufacturing and banking sectors. Here, changes in manufacturing returns Granger-cause growth in the bank price index at the 1% level, while changes in interest rates Granger-cause bank stock prices at only the 9% level. The positive coefficients on the lending rate contrast sharply with those obtained for the first equation of Model 1. In particular, the apparent role for rising interest rates in improved bank price performance might derive from passive profit-taking by banks during the early and middle phases of business expansions. Changes in total manufacturing returns do not Granger-cause changes in the lending rate. Combined with the results for equation (3c), this suggests that lending rates were less sensitive to manufacturing returns than to banking returns and that the

TABLE III
Estimates for Vector Autoregressive Models

Model 1	MPL_{-1}	MPL_{-2}	BTR_{-1}	BTR_{-2}	$LINT_{-1}$	$LINT_{-2}$	R^2/(DW)
MPL	0.476	0.036	1.207	0.220	-2.154	-0.383	0.618
	(2.252)	(0.180)	(5.295)	(0.656)	(3.414)	(0.704)	(2.01)
F-test	0.041		0.000		0.008		
BTR	-0.274	0.139	-0.707	-0.177	0.276	-0.306	0.398
	(1.394)	(0.753)	(3.336)	(0.566)	(0.470)	(0.607)	(2.03)
F-test	0.392		0.010		0.660		
LINT	0.004	0.007	-0.173	-0.016	-0.362	-0.235	0.493
	(0.060)	(0.110)	(2.411)	(0.150)	(1.822)	(1.371)	(1.77)
F-test	0.985		0.073		0.154		

Model 2	BPL_{-1}	BPL_{-2}	MTR_{-1}	MTR_{-2}	$LINT_{-1}$	$LINT_{-2}$	R^2/(DW)
BPL	0.241	-0.014	0.291	0.126	0.715	0.237	0.587
	(1.191)	(0.066)	(5.009)	(1.599)	(2.342)	(1.026)	(2.00)
F-test	0.465		0.000		0.083		
MTR	-1.264	-0.821	-0.710	-0.408	-0.470	-0.721	0.438
	(1.791)	(1.116)	(3.497)	(1.484)	(0.441)	(0.893)	(2.05)
F-test	0.048		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)	(0.376)	(2.482)	(1.671)	(1.73)
F-test	0.631		0.221		0.049		

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 equations 3a-3c and 4a-4c. 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 "F-test" for each equation reports the p-value for a null hypothesis that the lags of each system variable are jointly zero (no Granger causality). The final column reports R^2 and Durbin-Watson statistics for each equation.

transmission of manufacturing shocks to the banking sector did not involve lending rates.

Although the systems do not appear to be cointegrated, we also allowed possible long-run relationships to enter our models through an error-correction mechanism as a further check on robustness. We included the stationary combination estimated by the Johansen technique as an additional regressor in each differenced VAR. The vector error correction model (VECM) corresponding to Model 1 revealed a tendency for manufacturing prices to adjust downward in response to deviations in the stationary combination attributable to increases in lending rates, as well as a tendency for lending rates to fall in response to deviations caused by rising total bank returns. There was no tendency for manufacturing returns to adjust in response to the same deviations. For Model 2, only the lending rate equation had a significant error correction term which indicated a tendency for lending rates to fall in response to rising bank returns. These results are consistent with those obtained with the differenced VARs and offer additional evidence of a leading role for banks in manufacturing price performance.

D. Simultaneity Issues

The processing rule adopted for computing total returns admits an alternative interpretation of our causality findings. Recall that the total return for traded bank stocks is given by

$$BTR_t = (BPL_{t+1} - BPL_t + BD_t) / BPL_t \,, \tag{5}$$

where the lowest price of each stock in any calendar year is used to compute the BPL index. If low prices were observed at the end of each year, this formulation would measure capital gains for year t+1, and the total return that we attribute to year t would contain a component of future information. Importantly, if all low prices for manufacturing firms were observed at the end of each calendar year, our findings of statistical causality between banking returns and one-year ahead changes in interest rates and the manufacturing price index would actually be a result of contemporaneous correlations. While the extreme case described here is unlikely, any timing of price observations that deviate from the start of each calendar year can contribute information from year t+1 to a year t variable.

The potential simultaneity problem vanishes, however, if we assume that changes in total bank returns could have affected lending rates and manufacturing prices in the same calendar year while some lags were involved in the transmission of changes in the lending rate and manufacturing prices to consequences for bank returns. This assumption is plausible given that interest rates adjusted quickly to changing money market conditions (Martin, 1871, p.37) and that stock prices contain volatile components that reflect the expected present value of future growth opportunities. On the other hand, the tendency of mid-nineteenth century bank directors to smooth dividends (see Figure IIa) and postpone write-offs of bad loans—particularly those granted to themselves or other insiders (Baskin, 1988; Lamoreaux, 1994)—could have delayed the response of bank returns to declines in manufacturing performance until rumors of bank insolvency became publicly known.

If this timing assumption were false, shocks to the manufacturing price index would affect total banking returns and lending rates in the same calendar year. Unfortunately, the unknown timing of individual price observations in our data set renders conclusive tests of this implication impossible. Nevertheless, if the relationships that we find between year t bank returns and year t+1 lending rates and manufacturing stock prices are a result of future information in the first lag of the total bank return, one might expect the computed total bank return for year t+1, which certainly contains a component of information from calendar year t+1, to be correlated with manufacturing prices in the same year. In regression notation, equation (3b) could be modified to include contemporaneous changes in the manufacturing index and the lending rate:

$$BTR_t = \mu + \sum_{i=0}^{2} \alpha_i MPL_{t-i} + \sum_{i=1}^{2} \beta_i BTR_{t-i} + \sum_{i=0}^{2} \gamma_i LINT_{t-i} + \epsilon_t \,. \qquad (6)$$

Failure to find significance of the time 0 variables on the right-hand side would support the notion that contemporaneous correlation between manufacturing prices and banking total returns are not driving the causality findings for equation (3a) that we report in Table III.

When we estimated equation (6), the contemporaneous value of the manufacturing price index entered with an insignificant and negative coefficient, while the manufacturing price block continued to figure insignificantly in explaining total returns for traded bank stocks. The coefficient for the time 0 interest rate also entered with an insignificant coefficient. Overall, the R^2 for the equation rose from 0.398 to only 0.497 with the contemporaneous terms included. These results are consistent with a leading role for banking returns in the time paths of the other system variables, even when price and interest rate responses occur rapidly.

V. Conclusion

The returns to stockholders in the early to mid-nineteenth century who had invested in securities traded on the Boston stock market, like those to investors on the New York exchange a few years later, came largely from dividends rather than price appreciation—the source of most of the gains on most markets today. The investor who put a $1 in the market in 1835 would have been lucky to get that dollar back for most of the next 35 years. Indeed, to the extent that there was inflation, the investor who sold her stock at almost any time during this period (unless they had managed to buy low and were selling high) was unlikely to receive in real purchasing power what she had earlier invested in the stock. 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 nineteenth century approaches the price gains recorded during any of the twentieth century bull markets.

In part this differential performance between then and now reflects differences in corporate strategy. In the nineteenth century, incorporated business 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, however, the rational investor should be indifferent between dividend payouts and capital gains, that is the investor is really concerned with their total return regardless of whether this is paid in the form of semi-annual 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 18 fold by 1869 if invested in industrials (Figure VI). Even if invested more conservatively in the banks that financed business including manufacturing, the $1 would have grown 15 fold during the same period. Even in real terms, the gains were temptingly large—14 fold and 12 fold using BLS prices, and 12 fold and 10 fold using BDS prices.

Over the entire period, this performance exceeds that posted by the New York Stock Exchange over any comparable historical period (except the present). Certainly, the Boston 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

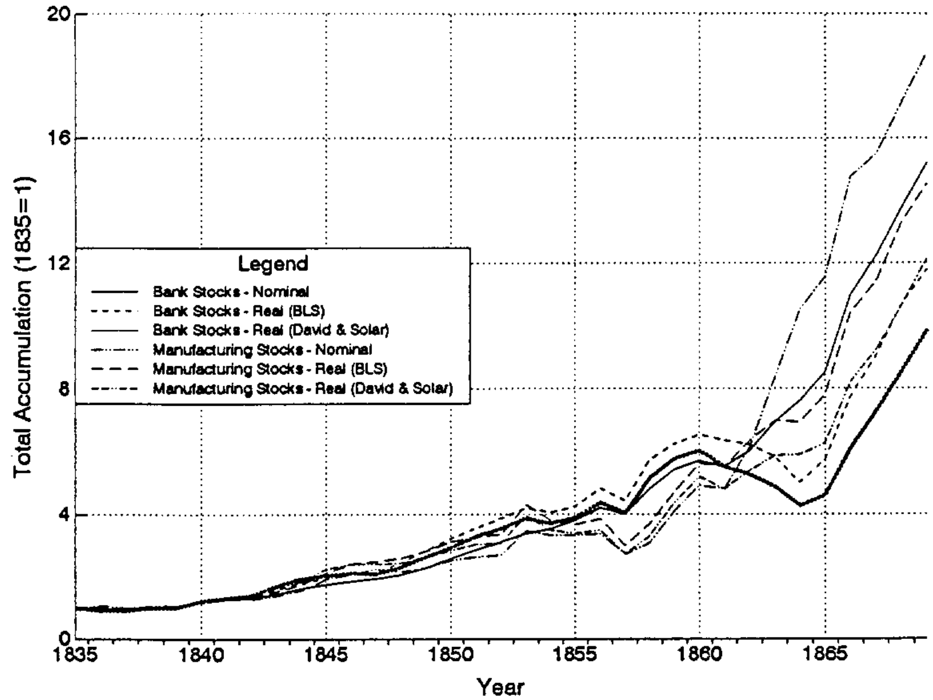

Figure VI
Cumulative Return From Initial $1 Stock Market Investment

an investment in the Boston market depended heavily upon gains (price and dividends) realized 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). It seems to have had a major impact, at least on the Boston stock market and presumably some of this must inevitably 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 payments problems by 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. 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.

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Appendix

This appendix presents the new time series described in the paper, and plots the number of firms included in the index calculations for individual years. Tables A.1 and A.2 include price indices for the banking and manufacturing sectors based on low prices, high prices and the average of high and low prices in each year weighted both equally and by the share of each firm in total sector capitalization. Tables A.3 and A.4 present par value dividends, dividend yields, and total returns for banks and industrials, also weighted equally and by capital share. Figures A.1 through A.3 present the firm coverages for par value dividends, dividend yields, price indices and total returns using annual low prices under the capital-weighting scheme.

TABLE A.1
Price Indexes For Banks Traded on the Boston Stock Exchange, 1835-1869

Year	High Prices Capital Wt.	High Prices Equal Wt.	Low Prices Capital Wt.	Low Prices Equal Wt.	Average Prices Capital Wt.	Average Prices Equal Wt.
1835	100.00	100.00	100.00	100.00	100.00	100.00
1836	92.23	97.94	92.60	93.20	95.47	95.62
1837	95.12	94.62	87.41	84.73	91.30	89.74
1838	93.02	89.66	86.13	80.30	89.60	85.00
1839	92.89	89.57	81.88	75.78	87.42	82.66
1840	91.39	88.63	86.63	80.25	88.94	84.36
1841	91.90	88.84	88.67	82.49	90.16	85.52
1842	87.31	83.82	83.35	76.95	85.19	80.21
1843	91.39	88.00	86.52	80.11	88.80	83.84
1844	93.18	90.06	93.23	87.16	92.92	88.31
1845	96.67	93.91	94.53	87.87	95.33	90.58
1846	95.75	93.45	93.08	86.88	94.14	89.85
1847	94.34	92.35	90.94	86.24	92.35	88.93
1848	91.37	89.57	89.74	84.73	90.24	86.78
1849	95.85	93.48	92.41	87.12	93.81	89.90
1850	99.90	97.77	96.82	91.40	98.03	94.24
1851	100.89	98.68	99.08	93.37	99.70	95.72
1852	103.21	101.27	100.68	95.00	101.67	97.87
1853	102.93	101.09	101.67	96.43	102.00	98.47
1854	102.81	101.66	98.81	93.90	100.53	97.45
1855	102.02	100.69	98.85	93.79	100.15	96.91
1856	102.04	100.63	101.02	95.65	101.21	97.79
1857	102.33	101.08	88.37	85.96	95.16	93.18
1858	103.45	102.35	98.73	93.15	100.59	97.31
1859	104.64	103.68	104.45	99.11	103.94	100.90
1860	106.71	105.84	102.37	97.44	103.99	101.15
1861	103.64	102.95	92.33	87.98	97.54	94.99
1862	100.00	99.24	93.91	89.41	96.40	93.79
1863	104.91	104.06	101.88	96.35	102.74	99.61
1864	119.27	116.88	104.58	98.83	110.95	106.66
1865	122.98	120.75	106.12	100.54	111.77	108.26
1866	123.31	121.19	113.10	105.87	113.50	110.15
1867	123.49	122.25	115.58	109.37	114.74	112.36
1868	127.41	126.36	119.65	112.67	118.47	115.87
1869	127.80	127.74	121.06	114.60	119.20	117.37

The table lists price indexes for traded bank stocks with 1835=100. The first four columns include the capital and equally weighted series that correspond to Figure IIIa and the descriptions of Section II.B in the text. The final two columns include indexes constructed from the average of high and low prices for individual stocks in each year.

TABLE A.2

Price Indexes For Manufacturing Firms Traded on the Boston Stock Exchange, 1835-1869

Year	High Prices Capital Wt.	High Prices Equal Wt.	Low Prices Capital Wt.	Low Prices Equal Wt.	Average Prices Capital Wt.	Average Prices Equal Wt.
1835	100.00	100.00	100.00	100.00	100.00	100.00
1836	102.78	102.12	100.20	98.90	101.39	100.44
1837	93.98	92.25	83.90	81.93	88.93	87.07
1838	94.18	91.75	84.68	83.14	89.26	87.27
1839	90.42	89.68	81.89	81.44	85.77	85.19
1840	82.10	80.90	81.40	79.88	81.17	79.82
1841	83.85	83.18	85.15	82.82	83.78	82.31
1842	78.93	78.09	77.87	77.39	77.71	77.01
1843	86.67	85.45	81.93	79.83	83.53	81.87
1844	96.01	94.98	89.31	86.77	91.72	89.96
1845	103.31	102.07	96.21	93.83	98.49	96.62
1846	102.78	101.20	92.04	90.70	96.15	94.58
1847	95.21	95.23	85.25	85.29	88.90	88.78
1848	82.62	84.24	73.81	74.92	76.89	78.11
1849	82.65	83.43	71.50	73.05	75.57	76.61
1850	82.20	83.57	74.17	74.82	76.48	77.37
1851	80.01	81.75	71.48	71.53	74.05	74.83
1852	85.28	85.16	68.97	68.52	75.32	74.83
1853	86.76	86.37	83.50	83.60	82.47	81.73
1854	80.03	80.26	73.21	72.54	74.32	73.62
1855	72.25	71.63	66.56	65.99	67.06	66.04
1856	69.16	69.21	63.75	63.56	64.01	63.57
1857	63.88	63.77	46.66	47.64	53.62	53.59
1858	64.97	63.53	48.11	49.51	53.02	52.73
1859	72.31	70.44	61.98	63.71	62.07	61.76
1860	86.46	84.35	68.52	70.07	71.55	71.10
1861	78.41	77.47	59.94	62.59	63.82	64.43
1862	109.00	107.17	70.84	72.79	82.90	82.88
1863	123.55	118.97	85.87	89.83	95.51	94.88
1864	120.56	119.35	90.86	94.92	96.06	96.99
1865	125.35	124.68	89.05	94.34	97.24	98.98
1866	127.80	128.52	102.52	109.31	104.08	106.48
1867	116.15	117.58	91.99	95.32	93.92	95.21
1868	116.17	113.85	92.20	94.69	93.63	92.64
1869	112.98	111.04	92.38	95.54	93.12	91.58

The table lists price indexes for traded manufacturing stocks with 1835=100. The first four columns include the capital and equally weighted series that correspond to Figure IIIb and the descriptions of Section II.B in the text. The final two columns include indexes constructed from the average of high and low prices for individual stocks in each year.

TABLE A.3

Dividends and Total Returns of Banks Traded on the Boston Stock Exchange, 1835-1869

	Dividends (% of Par)		Dividend Yield		Total Return	
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	5.29	6.20	6.04	8.56	8.58
1841	5.41	5.59	6.16	6.35	0.16	-0.62
1842	5.24	4.99	6.24	6.00	10.03	10.12
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	6.60	6.66	7.17	7.28	4.87	6.54
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	7.88	8.80	8.38	8.84	8.12	8.23
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	6.81	7.16	6.94	7.03	-2.91	-2.85
1861	6.50	6.68	7.31	7.27	9.02	8.90
1862	6.09	6.25	6.70	6.66	15.19	14.43
1863	6.84	7.07	6.87	7.01	9.52	9.57
1864	10.74	11.19	10.80	11.06	12.18	12.55
1865	22.86	21.66	22.19	20.91	28.77	26.20
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

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 series correspond to Figures IIa and IIc, and the descriptions of Section II.A in the text. The total returns series correspond to Figure IVa and the descriptions of Section II.C in the text.

TABLE A.4
Dividends and Total Returns of Traded Manufacturing Firms, 1835-1869

Year	Dividends (% of Par) Capital Wt.	Dividends (% of Par) Equal Wt.	Dividend Yield Capital Wt.	Dividend Yield Equal Wt.	Total Return Capital Wt.	Total Return 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	7.56	7.42	8.21	8.06	-4.12	-5.17
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

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 series correspond to Figures IIb and IId, and the descriptions of Section II.A in the text. The total returns series correspond to Figure IVb and the descriptions of Section II.C.

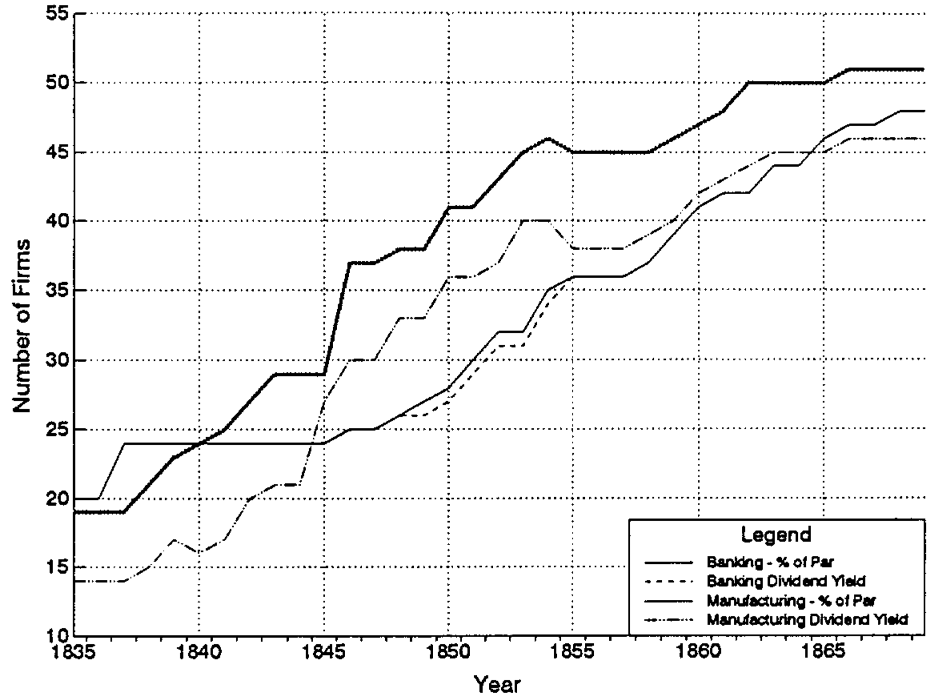

Figure A.1
Coverage of Dividend Series

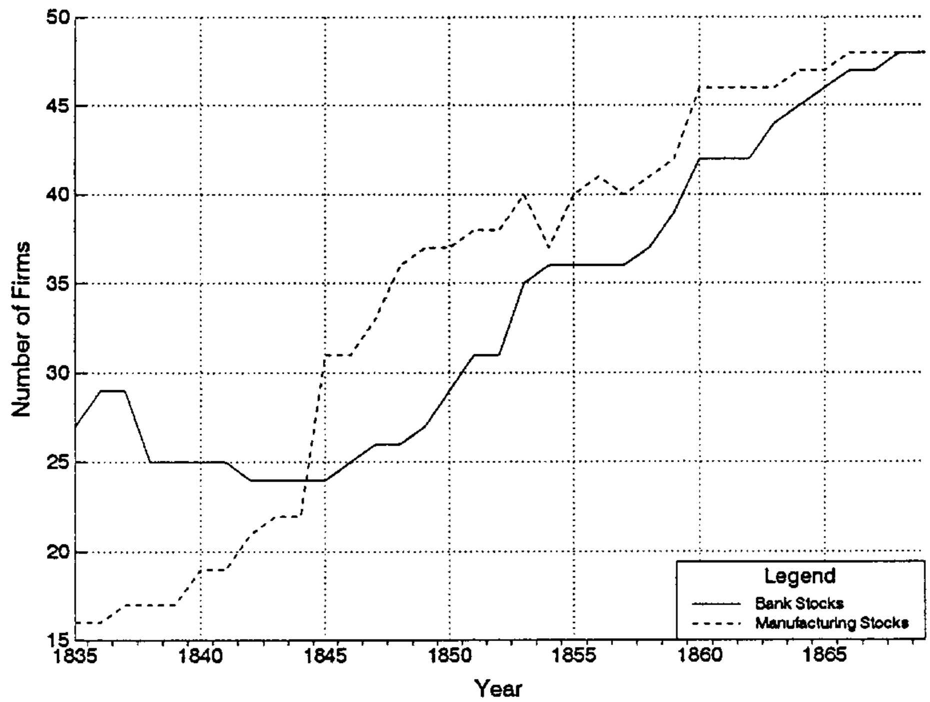

Figure A.2
Coverage of Low-Price, Capital-Weighted Stock Price Indexes

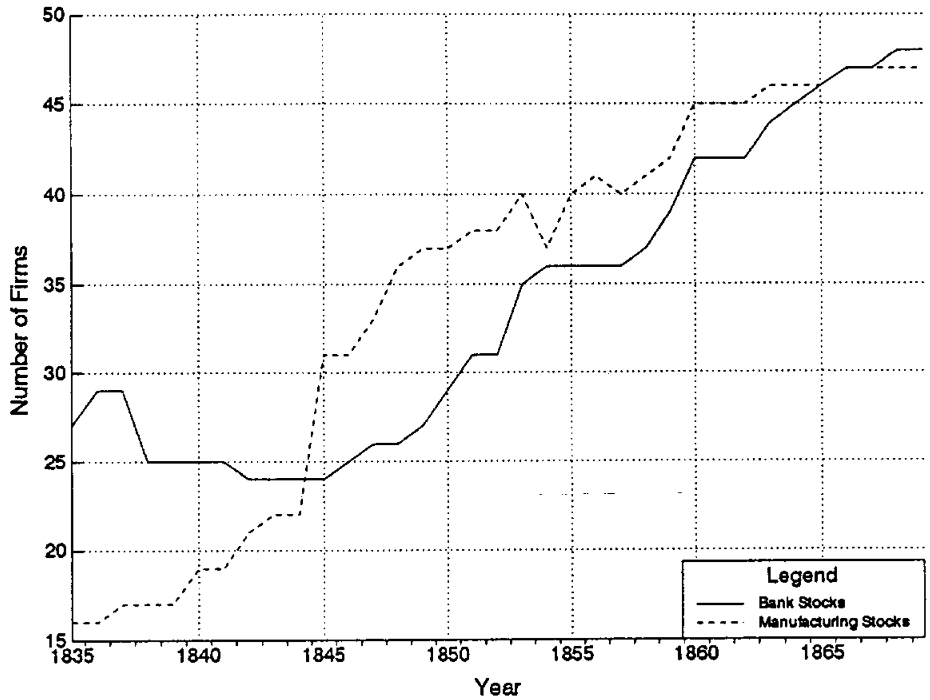

Figure A.3
Coverage of Low-Price, Capital-Weighted Total Returns