

**INTEREST RATES
AND
STOCK SPECULATION**



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INTEREST RATES
AND
STOCK SPECULATION

*A Study of the Influence of the Money
Market on the Stock Market*

BY
RICHARD N. OWENS
AND
CHARLES O. HARDY

WITH THE AID OF THE COUNCIL AND STAFF
OF THE INSTITUTE OF ECONOMICS

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DIRECTOR'S PREFACE

One of the most universally accepted principles of finance is that stock market speculation is primarily governed by variations in interest rates. According to the prevailing view, low interest rates cause increased borrowing for stock exchange speculation and a consequent rise in stock values, while high interest rates check speculation and produce a fall in stock prices. This doctrine is not a matter of mere academic interest. It has been accepted by bankers, financial writers, and practical business men, as well as by the economists of the schools. It is, moreover, continually used as a basis of general business forecasts of far-reaching importance and influence. This principle is also believed by many economic writers to yield the key to the control of the fluctuations of the business cycle.

In this volume the Institute of Economics has appealed to the facts of our financial history with a view to testing the correctness of this time-honored doctrine and has critically examined its theoretical foundations. The statistical investigation covers the history of interest rates in relation to stock exchange speculation in the New York money market over a period of some 50 years. The conclusion

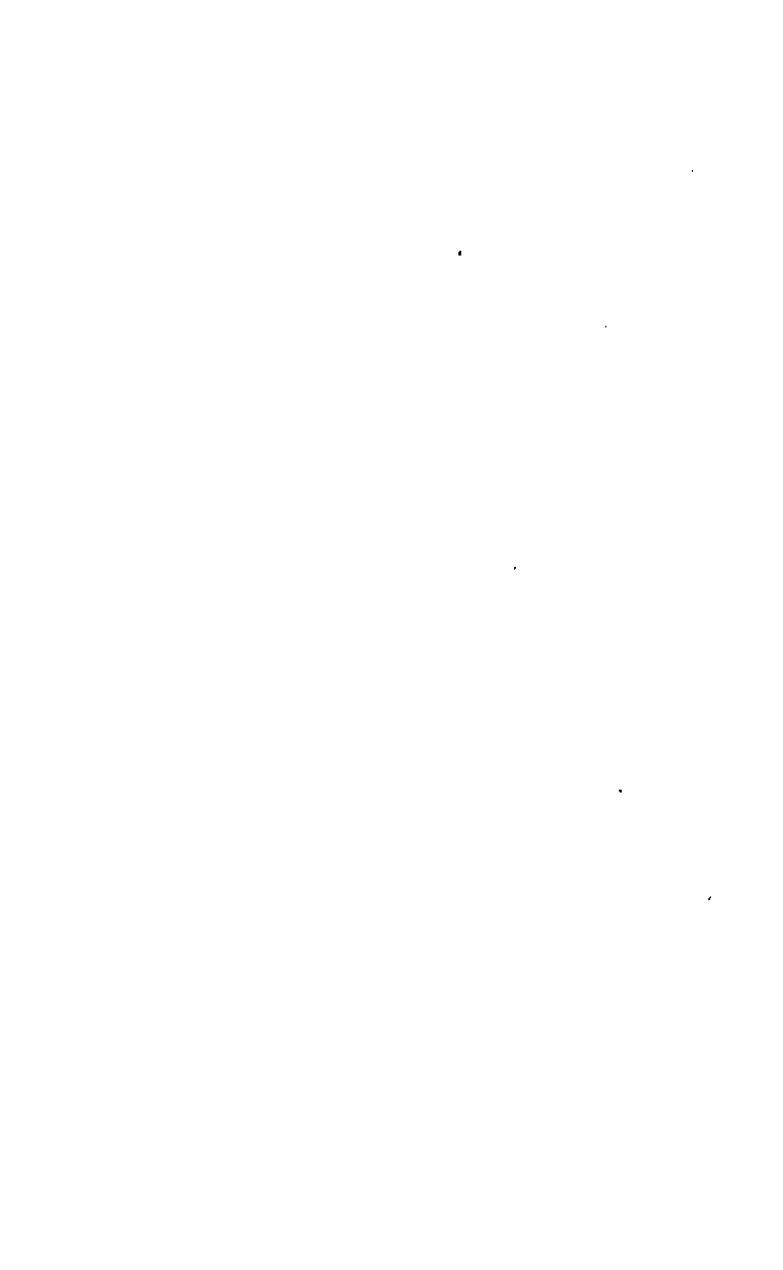
reached is that neither economic analysis nor historical research reveals any foundation for the accepted theory.

The present study is directed to the single question of the relation of changing interest rates to stock speculation. It does not supply a substitute theory of the causes of speculative activity, nor does it inquire into the effects of changing interest rates on other forms of business. In a subsequent investigation a test will be made of the correlative theory that changes in interest rates are primarily responsible for changes in the volume of commercial borrowing, and hence for the fluctuations of general business activity.

AUTHORS' PREFACE

In addition to their indebtedness to the Council and other members of the staff of the Institute, the authors are under special obligation to Adah L. Lee for a critical reading of the entire manuscript which resulted in many valuable suggestions. Max Sasuly has also given very valuable advice in regard to the statistical methods employed, and has supervised the computations.

A word in regard to the division of responsibility between the authors is necessary. The study was originally undertaken by Mr. Owens at the suggestion and under the direct supervision of the Director of the Institute. Mr. Hardy became a collaborator after the data had been collected and put in preliminary form. Chapter I was written jointly by Mr. Owens and Mr. Moulton; Chapter VIII by Mr. Hardy. The remainder of the book is the joint work of Mr. Owens and Mr. Hardy.



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**INTEREST RATES
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INTEREST RATES AND STOCK SPECULATION

CHAPTER I

THE ACCEPTED THEORY OF THE RELATION OF INTEREST RATES TO STOCK SPECULATION

THE generally accepted theory of the relation of interest rates to stock market speculation cannot be adequately stated in a single sentence. Some writers on the subject have been concerned only with short time seasonal fluctuations in speculative activity, while others are interested merely in longer time cyclical variations in stock prices. At the same time, different writers have stated the relationship of money rates and speculation with varying degrees of emphasis. As a preliminary to a detailed factual study of the soundness of the theory, it is, therefore, necessary to give a somewhat detailed exposition of the theory itself. In order to simplify the analysis and clarify the issues, the theory is presented separately as it relates respectively to seasonal and to cyclical variations in interest rates.

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I. SEASONAL FLUCTUATIONS IN INTEREST RATES.

Seasonal fluctuations in interest rates have been primarily due to seasonal variations in business activity. It is necessary to say *have been due* for the reason that seasonal fluctuations in interest rates since the organization of the Federal Reserve System have become of much less importance.¹ While it is perhaps too early to appraise the permanent effects of the new banking system, it is the prevailing view that one objective of the banking reform movement which led to the Federal Reserve System has been attained: namely, a substantial reduction of the seasonal variations in interest rates. However this may be, the greater part of the period under discussion in this study antedates the establishment of the Federal Reserve System; accordingly the discussion of *seasonal* variations in interest rates is based on the conditions existing under the old National Banking System.

Seasonal fluctuations in business activity occasioned seasonal variations in call loan rates. Before the establishment of the Federal Reserve System, there were four more or less distinct seasonal variations in interest rates in the course of each year. The first movement, from early January until about

¹In revising their index of banking for the period 1920-23, the Harvard Committee on Economic Research made no adjustment for seasonal variation in interest rates until January, 1923. Beginning with that month, they made one-half the pre-war adjustment. *Review of Economic Statistics*, January, 1923, Vol. V, p. 193.

the middle of February, is characterized by low interest rates. This is attributable to the fact that the crop movement, with its great demand for money in the West and South, has passed its peak, and has been followed by a heavy flow of cash from the country banks to the primary money markets. At the same time, the demand for funds is relatively slack, for business in general is characteristically dull during the interval between the holidays and the opening of the spring manufacturing and trading season.

The second period, which is marked by rising interest rates, is largely attributable to the monetary demand of producers and manufacturers. This demand is supplemented, particularly in the latter part of the period, by crop planting requirements.

The third important seasonal variation is that of a weakening money market in April and May, followed by a genuine depression in June and July. This period at its beginning reflects a declining demand for funds by the manufacturing and producing interests of the industrial centers, and in its latter stages the return of funds from the country districts following the completion of the crop planting period.

The fourth season is generally referred to as the crop moving period. The demand for funds in the country districts for the paying of farm labor, the storing of grain, and the moving of produce to the primary markets calls for an outflow of funds from

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the financial centers to the interior. At the same time, the demand from producing and manufacturing enterprises which are making ready for the fall trade becomes very heavy, thus bringing added pressure to bear on the financial markets. This period ordinarily reaches a peak in October, with interest rates commonly remaining high till January.

It will be observed that the varying demands of business for the available supply of money in the country have alternately led in the past to an accumulation and a depletion of loanable funds in the banks of financial centers, particularly in New York. To understand why funds which temporarily were not needed in the outlying districts should have accumulated in New York, it is necessary to understand both the system of correspondent banks and the call loan market.

The credit problem of the average individual bank is much the same as that of the individual farmer or manufacturer. At certain periods of the year it is necessary to borrow money, and at other periods of the year, more cash is in hand than can be used in the business. The banker, therefore, at certain times borrows from correspondent banks in the financial centers, and at other seasons he places money on deposit in such banks. As a rule, the city banks pay 2 per cent interest on bankers' deposit accounts.²

²The following statement is typical of the general situation: "The New York banks are in the habit of allowing 2 per cent interest upon country deposits subject to call. The consequence

The New York banks are able on their part to pay interest on bankers' deposits through lending the money to speculators on the Stock Exchange. In periods of dull business, New York offers the most important market where funds may be loaned subject to repayment on demand.³ This is accomplished largely by means of call loans.⁴

Call loans are one-day loans which are terminable at any time at the will of either borrower or lender. The lender may call for repayment on any day

is that the interior banks, failing any other avenue of profitable short-time employment, remit to New York not only the authorized quota of their reserves, but also the surplus funds which accumulate with recurring business inactivity.

"It is not possible for the New York banks to employ all of such deposits in mercantile loans and discounts, even were it sound banking to lend call money on time loans. The only method of profitable use is in demand loans, and the only large market is offered by speculative operations on the stock and produce exchanges." Hollander, J. H., *Bank Loans and Stock Exchange Speculation* (Publications of the National Monetary Commission, Vol. 20, No. 5), 1911, p. 25.

³"In the seasons of minimum demand, roughly speaking about midsummer and midwinter, the volume of our currency is often excessive, and the surplus funds find their way firstly into local banks through the process of deposit, secondly, into the banks of the reserve cities, and finally, into those of New York City. They follow this course because they must be held subject to the demand of those who own them, and consequently must be invested in such a form that they can be made available on very short notice. For such investment there is but one market in this country and that is supplied by the speculators on the New York Stock Exchange who borrow money subject to call in order to make the quick returns which that exchange makes possible." Scott, William A., Address before the Central Supply Association at Chicago, February 26, 1913.

At the present time Philadelphia also has a call loan market, but it is relatively unimportant.

⁴In recent years a large volume of funds has also reached New York for direct investment (through agents) in stock exchange securities.

between 10 a. m. and 12.15 p. m., and the borrower is equally free to repay the loan at any time. In practice, the loans are usually continued from day to day, the rate being subject to change each day. The call loan is used little for other than stock exchange purposes.

Under the old banking system seasonal fluctuations in business activity were quickly reflected in the money market. The accumulation of idle money in New York in seasons of business inactivity was almost immediately reflected in a decline of "call money" rates. Similarly, the depletion of the money supply of the metropolis when the interior banks withdrew their funds in periods of seasonal activity was promptly followed by a rise in call loan rates. Since the supply of "call money" constituted a sort of final reserve of lending power, variations in the quantity available naturally produced wide fluctuations in the rate of interest.

II. ACCEPTED THEORY OF SEASONAL VARIATIONS.

So much for the facts about seasonal fluctuations in business and in money rates, and the mechanism by which idle funds were concentrated in the New York money market and rendered available for speculative activities. We may pass now to the theory of the relation of changing interest rates to stock speculation.

The theory under consideration assumes that variations in call loan rates caused variations in

stock speculation. The decline of the rate of interest is said to be the signal for increased activity on the part of speculators. These speculators, so we are told, hasten to take advantage of the cheap money by borrowing funds with which to purchase stocks.⁵

The call loan market is said to be able at all times to absorb any volume of surplus funds if only the rate is put low enough.⁶ The further the rate is lowered the greater the volume of demand. There is supposed to be no limit to the demand for

⁵ "At those seasons of the year when interest has fallen to a low level in New York owing to the inflow of funds from the country, bank loans have been abnormally cheap and available for the use of speculators. The speculators have under these conditions hastened to avail themselves of the opportunities held out to them by extending their transactions in stocks on margin. Brokers have obtained accommodation at the banks, putting up the securities themselves as collateral to protect the loans." Laughlin, J. Laurence, *Banking Reform*, 1912, p. 115.

"The continual decline in the relative demand for moneyed capital from April to July, which finds expression in such phenomena as large bank reserves, low interest rates, gold exportations, and high security prices, naturally brings its own corrective to some extent. Large bank reserves and low interest rates encourage increased loans and speculation; gold exports reduce reserves; and so on." Kemmerer, E. W., *Seasonal Variations in the Relative Demand for Money and Capital in the United States* (Publications of the National Monetary Commission, Vol. 22), 1910, p. 29.

⁶ "In New York, however, as in the money centers of other countries, the demand for loans is at all times of practically indefinite proportions. Through the purchase of paper from note brokers and by means of stock exchange loans the New York banks can at all times fully employ their resources if they are willing to make sufficient concession in rates to borrowers. This they are under the necessity of doing in consequence of paying interest on bankers' deposits at the fixed rate of 2 per cent. regardless of conditions in the loan market." Sprague, O. M. W., "Proposals for Strengthening the National Banking System," *Quarterly Journal of Economics*, 1910, Vol. 24, p. 637.

money *at a price*, any more than there is to the demand for wheat.

Just why the decline of interest rates in mid-winter and early summer should induce speculators to borrow increased amounts of money with which to purchase stocks is, however, not always made clear. Two reasons have been advanced. First and most important, the dividend rate on stocks may exceed the interest rate. If funds can be borrowed at a rate lower than the yield on stocks at prices prevailing in the market, it is argued that the trader will purchase stocks to make a profit from the difference between the two rates. Secondly, it is sometimes argued that, since interest is a part of the cost of speculation, a decline in the rate increases the probability of securing profits from speculative purchases and, therefore, encourages such operations. Both of these reasons for supposing that a low interest rate should stimulate stock speculation will be discussed in Chapter X. For the present, we must be content to let the argument stand as stated.

Conversely, the advance of interest rates, with the approach of the busier season in the spring and again in the early autumn is believed to cause a curtailment of speculation. The calling of loans by the New York banks is held to force sales of securities at a sacrifice with serious losses to speculators.⁷

⁷ "The recurrent fluctuations of today lead inevitably during the slack season to the diversion of a considerable amount of our banking resources into the call loan market of our financial centers

Most of the statements of the theory which we have quoted appeared in discussions of banking reform published before 1913. That the theory is, however, still widely held by economists, is apparent from statements of it appearing in recent financial literature.⁸

and their utilization as a basis for stock market transactions. And so, in the busier agricultural and commercial seasons, when these loans are withdrawn to meet the increasing demands of business, there follows regularly financial distress in the money markets, with heavy sacrifice of security values, while farmers, traders, and business men are confronted with oppressive borrowing rates in other parts of the country." Andrew, A. Piatt, then Assistant Secretary of the Treasury, Address before the Indiana Bankers' Association, October 24, 1911. For additional statements of the theory, see the following:

Richardson, William A., *Finance Report*, 1873, pp. xv-xvi.

Bendix, Ludwig, *The Aldrich Plan in the Light of Modern Banking*, 1912, pp. 21-2.

Kent, Robert, *Rand-McNally Bankers' Monthly*, March, 1911, p. 19.

Forsythe, F. D., *Rand-McNally Bankers' Monthly*, November, 1911, pp. 21-2.

Report of the Comptroller of the Currency, United States Government Report, 1906, p. 67.

⁸"In the past the alternating ebb and flow of money with its resulting scarcity of funds at one season and abundance in another, due to defects in our national banking system, caused great disturbance in the money market, notably in the eastern centers. When the banks of the interior began to draw down their New York balances in the autumn, the New York banks were compelled to curtail their loans. This affected not only stock exchange operations but also commercial loans to business houses, which at that season of the year require not less but more loan accommodations. On the other hand, the flow of money back to New York at the beginning of the year caused large surplus reserves, low rates for money, and an expansion of loans for speculative purposes." Holdsworth, J. T., *Money and Banking*, 1923, pp. 235-6.

"By all these expedients but a slight margin of elasticity was lent to the currency. The notes moreover showed themselves wholly unresponsive to the variations of commercial need. As they were returned from the country districts after the peak of crop moving demand had passed, they were seldom retired in

The seasonal variation in stock speculation is believed to have been a serious evil. The evils caused by stock speculation are said to have manifested themselves both in seasons of business dullness and in periods of great business activity. The evils to which reference is made are various and sundry—overtrading, unhealthy speculation, the flotation of unwise ventures, credit inflation, being among the descriptive terms employed.⁹

J. H. Hollander portrays the evil effects upon business in the following language:

The situation encourages speculative commitments at the very time when quiescence is in order. As there is unwholesome stimulation, so there is sudden and wasteful liquidation. When reviving business leads the interior banks to reduce their balances, the depository banks meet the strain by calling loans, with the result that the speculative movement for the rise is reversed and a repressive influence cast upon business.¹⁰

It should be added, perhaps, that some writers have insisted that the evils resulting from the stimulation of stock speculation in seasons of low interest rates, and the curtailment of speculation in seasons of high interest rates, are not sufficiently serious to

volume, but instead were used as a basis for market loans, figuring in the reserves of state institutions, although debarred by law from occupying a similar position in national banks." Willis, H. P., *The Federal Reserve System*, 1923, p. 31.

⁹ See Richardson, *Finance Report*, p. 16; Bendix, *The Aldrich Plan*, p. 21; Kent, *Rand-McNally Bankers' Monthly*, March, 1911; Laughlin, *Banking Reform*, p. 115; *Report of Comptroller of the Currency*, 1906, p. 67; Forsythe, *Rand-McNally Bankers' Monthly*, November, 1911, p. 21.

¹⁰ *Bank Loans and Stock Exchange Speculation* (Publications of National Monetary Commission, Vol. 20, No. 5), 1911, p. 25.

warrant public concern, whatever may be the effects upon the personal fortunes of the speculators themselves.¹¹

III. ACCEPTED THEORY OF CYCLICAL FLUCTUATIONS.

Just as seasonal variations in the activity of business are accompanied by fluctuations in interest rates, so the oscillations of business in the ups and downs of the business cycle find a counterpart in alternating periods of tight and easy money. Indeed, the major importance of the theory under consideration is in connection with cyclical variations in interest rates.

Cyclical variations in speculative activity are said to be caused by fluctuations in interest rates. The reasoning underlying the accepted theory as related to cyclical movements is essentially the same as that underlying the theory as applied to seasonal variations. In a time of depression surplus funds accumulate in the financial centers, particularly in New York, where stock speculation is stimulated through the inducement of cheap money.¹²

The reasons advanced to explain why speculators borrow funds with which to purchase stocks in time of depression are the same as those advanced to

¹¹ Sprague, O. M. W., *Quarterly Journal of Economics*, 1910, Vol. 24, p. 640.

¹² The revival of speculative activity in time of depression is sometimes attributed to *declining* interest rates rather than to *low* rates as such; and, conversely, the decline of speculative activity late in a period of prosperity is attributed to *advancing* interest rates rather than to *high* rates. This doctrine (see Chapter VII below) does not, however, essentially modify the theory.

explain seasonal speculation. The most common argument is that if stocks pay dividends at the rate of 5 or 6 per cent and money can be borrowed at 2 or 3 per cent a trader or speculator can make 3 or 4 per cent profit by borrowing funds with which to purchase stocks.¹³ The objection that such a profit is small is met with the answer that traders and speculators engage in such transactions on a large scale, and that profits in the aggregate are substantial.¹⁴

Similarly, high rates of interest in periods of great business activity are held to cause a decline of speculative activity. High interest rates, it would seem, will naturally cause speculators to sell stocks carried at too high a cost; and the result will be a

¹³ "The piling up of these deposits in the banks of New York lowers the rate of interest on call money and incites speculation. If Union Pacific, for example, pays dividends of 10 per cent and is selling at 170 or under, it yields 5.6 per cent on the purchase price. If the purchaser can borrow money on call at 1.5 per cent, as is the case now, he gains a profit of 3.5 to 4 per cent as long as such conditions continue. Speculation thus started may run a considerable time and draw in a larger number of participants and extend sympathetically to the whole list. Speculators may bid up the price of stocks, and the rate of interest at the same time, until a climax is reached. Then a reaction will come, stock prices will fall, margins will be exhausted, speculators will be sold out, banks may fail, liquidation will pursue the inexorable course, and a *tabula rasa* will be made, upon which a new cycle of inflation and collapse may take its start." White, Horace, "The Stock Exchange and the Money Market," *Annals of the American Academy of Political and Social Science*, November, 1910, Vol. 36, No. 3, p. 87.

¹⁴ While the discussion has always centered around the call loan, it would be logical for the adherents of the theory to apply it also to the influence of the interest rate on the volume of short time collateral loans. Speculation, as a matter of fact, is not carried on exclusively with call loan funds.

bearish market.¹⁵ Other influences than high interest rates are, however, advanced in partial explanation of the check to speculative activity at the peak of the business cycle. It is pointed out that the banks restrict loans to stock speculators with a view to conserving funds for the use of their regular business customers. Another common explanation of the decline of speculation is that the withdrawal of funds from New York by banks in the interior of the country forces a curtailment of speculation.

There is some disagreement as to whether variations in call loan rates or variations in short time commercial rates cause cyclical variations in speculation. While most writers on the subject assume that the variations in call loan rates control speculation, there are some who contend that changes in the rate on short time loans are of controlling importance.

The short time loans referred to are business loans without collateral, with a maturity of from 60 to 90 days. It is argued that in a time of depression the short time interest rate declines to a point which makes it profitable for speculators to borrow funds to buy securities, or for the banks themselves to buy them. In times of prosperity when there is a brisk

¹⁵ "The movement of reserves, loans, deposits, and money rates is the causal factor working out its influence on stock and bond prices, transactions on the stock exchange, bank clearings, business failures, building, employment, production, imports and exports, prices and profits." Hansen, A. H., *Cycles of Prosperity and Depression in the United States, Great Britain and Germany, 1921*, p. 110.

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demand for commercial loans, the banks give preference to commercial over speculative and investment demands, withdrawing funds from the security markets and causing a bear movement. A concise statement of this theory is given in the footnote below.¹⁶

The cyclical variation in stock speculation was formerly regarded as a serious evil. The low rate of interest in time of depression was looked upon as

¹⁶“Starting with depression, *phase 1*, we have as a legacy from the preceding period of liquidation: (a) low prices of securities and volume of speculation: (b) declining commodity prices and business activity: (c) declining rates on commercial paper and increasing bank reserves. This situation, which existed during the first half of 1904, for instance, paves the way for the revival. The low volume of speculation and decreasing business activity have their correlative in rapidly falling rates for commercial loans. Rates presently decrease to a point which makes it profitable to purchase securities. In other words, securities selling at a very low price bring higher returns, even with depressed business, than the rate at which short-time money can be loaned. Idle funds, therefore, are drawn into the speculative market to purchase bonds and high grade stocks. As the speculative advance goes on, lower grade securities are purchased. With the upward movement of speculation we enter into the second phase of the business cycle. Increasing speculation is followed by increasing business activity. Funds at low rates are available to finance business, and consequently, an increase in business activity follows the advance of speculative activity. In *phase 2*, therefore, we have increasing speculation, increasing business, and increasing rates for short-time money following each other in the order named. Presently, however, the demands of speculation and business for funds cannot both be granted to the degree desired and we enter *phase 3*. Business is competing against speculation and speculation must give way. . . . The drain of funds from security markets into business causes, as its immediate effect, high rates for collateral loans whether on call or on time. The bull market in securities characteristic of *phase 2*, and the hesitation characterizing *phase 3*, is replaced by a bear market characterizing *phase 4*.” Persons, W. M., “A Non-Technical Explanation of the Index of General Business Conditions,” *Review of Economic Statistics*, 1920, Vol. II, pp. 46-7.

a baneful influence in that it stimulated speculation at a time when it should be discouraged.¹⁷ Similarly, the curtailment of speculation in a time of prosperity was said to bring about convulsions on the Stock Exchange and to cast a repressive influence upon business in general. One would almost gather from the literature of banking reform days that the stock market ought never to be allowed funds for speculation.

It is interesting to observe, in the light of these earlier statements of the generally bad consequences of speculation, that at the present time financial writers and the various forecasting agencies commonly see in a revival of speculation a very favorable business omen. They do not complain that the revival of speculation in a time of depression indicates that speculative commitments are being made at a period when "quiescence is in order." Rather they look upon it as forecasting something devoutly desired—a revival of general business activity. Likewise, in periods of active business a restriction of stock speculation is now pointed to as

¹⁷ "In the long run, commerce suffers more from the periods of overabundance (of money) than from those of scarcity. The origin of each recurring period of tight money can be traced to preceding periods of easy money. Whenever money becomes so overabundant that bankers, in order to keep it earning something, have to force it out at abnormally low rates of interest, the foundations are laid for a period of stringency in the not far distant future, for then speculation is encouraged, prices are inflated and all sorts of securities are floated until the market is glutted with them." Forgan, J. B., Address before the Texas Bankers' Association. Quoted in Phillips, C. A., *Readings in Money and Banking*, 1916, p. 717.

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an altogether constructive development, which will serve to usher in a period of orderly liquidation and minimize the danger of genuine inflation.

The period of time required for high or low interest rates to produce their effects upon stock speculation is not usually stated. The general theory seems to be that the effect of low or high interest rates upon stock speculation is immediate. If the explanation of the increase in speculation in a time of cheap money is that money can be made by borrowing funds at, say, 3 per cent and investing it in stocks yielding 6 per cent, there is obviously no reason why one should wait before taking advantage of the opportunity. In the theory as applied to seasonal changes, interest rates are supposed to influence speculation immediately. A decline of interest rates in midwinter or in early summer is held to be followed at once by increased speculation in stocks, with the result that when additional money is needed for spring or autumn business requirements, the funds have already been loaned out for stock speculation. An almost instantaneous effect is apparently implied.

Most writers state the theory without any differentiation between the seasonal and cyclical movements. The Harvard Committee on Economic Research do not, however, contend that seasonal variations in speculation are caused by seasonal changes in interest rates; and with reference to the cyclical movements they state that a year or more

of *advancing* rates is required to curtail speculation, and a year or more of *declining* rates is required to stimulate speculation.¹⁸ No other definite statement concerning the time required for the change in interest rates to have its effect, has been discovered.

In subjecting this accepted theory to the test of financial history, the discussion breaks into main divisions as follows: Chapter II deals with seasonal variations in call money rates in relation to stock exchange speculation; Chapter III is devoted to an analysis of day-to-day variations in interest rates as related to speculative activity; and Chapters IV to VIII are concerned with the longer swings of call loan and short time interest rates in their relation to stock speculation. In Chapter IX we examine the data for the post-war period in an attempt to distinguish the types of securities to which the theory does apply in a limited way from those to which it is quite inapplicable. Finally, in Chapter X we consider the logic of the theory.

¹⁸ *Review of Economic Statistics*, 1919, Vol. I, August supplement, p. 12. For further comment on this point, see Chapter VII of this book.

CHAPTER II

SEASONAL VARIATION IN CALL LOAN RATES AND IN STOCK SPECULATION

As was pointed out in the preceding chapter, seasonal variations in interest rates seem to have been greatly reduced as a result of the operations of the Federal Reserve System. A test of the theory that the variations of interest rates from season to season formerly caused similar variations in stock speculation is, however, still of very great importance since it throws light on the question of the causal relations between changes that are not of a seasonal character. The same line of argument is used to establish a relation between cyclical and between seasonal changes, and most economists who accept the one theory believe also in the other. In the present chapter we purpose, therefore, to examine the relation of the seasonal fluctuations in call loan rates to variations in speculation in securities. The theory will be tested by the data relating to transactions on the New York Stock Exchange. So far as the United States is concerned, it is unnecessary to include markets in other cities, as New York completely dominates the speculative security markets.

If low interest rates do stimulate speculation, the

effect should be observable either in a rise in the prices of securities or in an increased volume of sales. The supposed effect more often referred to by economists is that of a rise in prices; but since the rise in prices is said to be caused by increased purchases of securities, an increase in the volume of sales might also be expected. At least such is the assumption of most of those writers who have discussed the matter.

I. NATURE OF THE DATA USED IN THE STUDY OF SEASONAL VARIATIONS.

Before the data could be tested for seasonal variations in call loan rates and stock prices, a form of average had to be chosen. Obviously, the variation in security prices could not be tested by the prices of a single security. If the prices of several securities were used separately, the results would probably be conflicting and confusing. Hence, it is necessary to use index numbers showing the average change in the quotations of a selected group of securities. Another problem is whether to use daily, weekly, or monthly averages. These questions had to be decided largely on the basis of the character of the available data.

Monthly average call loan rates have been used in this study in testing seasonal variations. The month is a much more convenient unit of time to use in determining seasonal variations than is the day or week, and it is also short enough to permit

of a fair test of seasonal changes. Moreover, many of the averages of call loan rates and of stock prices which are available are in the form of monthly data.

The monthly figures which we have used for the call loan rates are averages of the high and low rates for each week in the month. The method of averaging is explained and the data are given in Appendix A.

The level of industrial stock prices is measured by an average of the prices of several stocks for each month. For the period from January, 1872, to September, 1922, we have used an index of industrial stock prices computed by the Reports Department of the Federal Reserve Bank of New York.¹ This index is an average of the high and low prices of a number of stocks for each month. For the period from 1872 to 1896 the number of stocks is usually 10, but it is 11 in a few of the years. From 1897 to 1914 the number of stocks is 12, and from 1915 to 1922 it is 20. This index is the only available average of industrial stock prices covering the long period to be studied. The averages of stock prices published by the *Wall Street Journal*, which the Federal Reserve Bank used in computing the monthly index for the period 1897-1922, are the averages gen-

¹The index has been made available for this investigation through the courtesy of officials of that bank. We are greatly indebted to them for the privilege of using the index, which is now published for the first time. A detailed explanation of the method by which this average was computed, a list of the companies whose securities were used, and the actual averages by months, will be found in Appendix B.

erally used by students of stock speculation. Although the number of stocks included in the average is not as large as might be desired, the index is accepted as being the best available for our purpose.²

This index of industrial stock prices is in the main an average of the prices of speculative stocks rather than of investment securities. For the period since December, 1914, the prices of common stocks only are used in computing the monthly averages. During the period previous to that month, and back as far as 1894, the prices of one or two preferred stocks are at times included. For the years from 1879 to 1893 inclusive, only common stocks are used. It is clear, therefore, that the index chosen is in this respect an appropriate one for the purpose for which we have used it. It indicates the changes in speculative activity.³

For the period from 1866 to 1880, an index of railroad stock prices is available. This index was constructed by Mr. Edwin Frickey.⁴ The prices of 10 railroad common stocks were used in its compilation. The data used were means of the monthly high and low quotations. These were averaged (geometrically) and reduced to percentages of the average of

²For a discussion of the limitations of index numbers of stock prices, see Mitchell, W. C., "A Critique of the Index Numbers of the Prices of Stocks," *Journal of Political Economy*, July, 1916, Vol. 24, pp. 625-93.

³For further discussion see Chapter IX, p. 100.

⁴*Review of Economic Statistics*, 1920, Vol. II, July supplement, p. 33.

the entire series. The index is reprinted in Appendix C.

In comparing the seasonal changes in call loan rates with the accompanying changes in stock prices three methods have been used. First, we have taken average interest rates and average stock prices for each month of the year during selected periods, and scrutinized them to determine whether there is any tendency for high rates at certain seasons of the year to be accompanied or followed by declines in the stock market, and vice versa. Secondly, we have examined the link-relative indexes of seasonal variation constructed by the Harvard Committee to see whether they reveal any tendency of this kind. Finally, we have examined the data year by year and month by month for a 42 year period to see how many times the action of the stock market supported, or contradicted, the theory under review. A discussion of the results of these comparisons is given in the three following sections.

II. SEASONAL INFLUENCES TESTED BY COMPARISON OF AVERAGES.

The first test for a possible relationship between seasonal variations in call loan rates and in stock prices covers the period from January, 1872, to December, 1891. The month of January, 1872, is chosen as the starting point because the index of industrial security prices begins with that month. December, 1891, is taken as the end of the period for

the test as a matter of convenience, since it closes a 20 year period.

Call loan rates show a marked seasonal variation. The seasonal variation in the rates has been determined by comparison of the median rates for each month.⁵ The medians are as follows:

MEDIANS OF CALL LOAN RATES, JANUARY, 1872, TO DECEMBER, 1891.

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Median Rate	4.65	3.57	4.12	4.25	3.35	3.15	2.57	2.95	4.42	4.62	5.00	5.03

The medians are shown graphically in the chart on p. 27.

These figures indicate two seasons of advancing rates and two of declining rates. The first season of the year is one of declining rates, in January and February. Although the rate in January is high, it

⁵The median is the rate so chosen that the number of rates higher than that figure is equal to the number of rates that are lower. In the period from 1872 to 1891, 20 rates were compared for each of the 12 months, since there were 20 years. If the rates for each of the 12 months of the year are arranged separately in order of size, the median falls midway between the 10th and 11th rate for each month.

The median is considered a more suitable average for call loan rates than the arithmetic mean. The arithmetic mean was computed for this period, but the results were distorted by the high rate for May, 1884. In that month the rate was 163.44 per cent, this high rate being a result of the stock market panic. The high rate for that year caused the average for the month of May for the 20 years to be very high, while all other tests showed May to be a month of low call loan rates. The median is not affected by the extreme height of the rate for that month. Except for May, however, the arithmetic average shows the same seasons of high and low money rates for this period that the median does.

For a discussion of the advantages of the median as a form of average for time series of economic statistics, see Persons, W. M., "Correlation of Time Series," *Handbook of Mathematical Statistics* (Ed. H. L. Rietz), 1924, pp. 155-58.

is lower than the rate for December. The second season is one of advancing rates, lasting through March and April. The third season, extending through May, June, July, and August, is one of low rates. The last season begins in September and lasts throughout the remainder of the year, this being a period of high rates.⁶

The seasonal variation in rates for call loans is pronounced. If there is any basis for the belief that variations in money rates cause seasonal variations in stock speculation, examination of the data for security prices should reveal seasons of high and low prices for securities.

Stock prices show no seasonal variations. The medians of security prices for each month have been computed, the method being the same as that used in computing averages of call loan rates. The medians of stock prices by months for the period from 1872 to 1891 are as follows:

MEDIANS OF INDUSTRIAL STOCK PRICES, JANUARY, 1872, TO DECEMBER, 1891.

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Median Price	52.50	53.00	54.00	54.00	53.00	52.00	54.00	53.50	54.00	53.00	54.00	53.50

No well defined seasons of high and low prices in

⁶The seasons of high and low rates indicated above are approximately the same as the periods found by Professor E. W. Kemmerer in his study of the New York money market for the years 1890-1908. Professor Kemmerer, however, divided the fourth season into two periods. Since both periods were marked by high money rates, the division is not necessary for present purposes. See Kemmerer, E. W., *Seasonal Variations in the Relative Demand for Money and Capital in the United States* (Publications of the National Monetary Commission, Vol. 22), 1910, pp. 223-24.

stocks appear. The median of course shows some variation from month to month, but the differences are small and the distribution of high and low figures is irregular. The highest prices were for the months of March, April, July, September, and November. Four of these five months are in seasons of high money rates when the theory under review indicates that stock prices should be low. The lowest median price for stocks is in June, when according to the theory stock prices should be high.

Since no seasonal variation in stock prices is detected by the study of the medians, another method has been tried. We have computed an arithmetic average of the 20 items for each calendar month during the period from 1872 to 1891. These are shown in the following table, and in the chart on p. 27.

ARITHMETIC AVERAGES OF INDUSTRIAL STOCK PRICES, JANUARY, 1872, TO
DECEMBER, 1891.

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Average Price	52.45	53.05	53.00	52.70	52.85	52.60	52.60	52.60	52.70	52.70	52.80	52.80

The variations shown by the monthly arithmetic averages are exceedingly small, and apparently are accidental. No definite seasons of high and low prices for securities appear. The conclusion that the month to month variations are not of seasonal character is supported by the fact that the arithmetic averages do not show the same months of high and low prices that the medians show. Absolutely uniform prices from month to month are not to be

expected; the slight variations which appear have no significance.

In these tests no allowance has been made for the influence of secular trend.⁷ A trend line was fitted for another purpose to the data for the period from 1872 to 1897.⁸ Comparison of the deviations from this trend line with the original data shows that our conclusions would not be affected by the substitution of data adjusted for trend for those which we have used.

During the period from 1872 to 1891, seasonal variations in rates for call loans did not cause seasonal variations in stock prices. During this period rates on call loans varied with certain well defined seasons of the year, while no seasonal variation in stock prices is observable. Apparently, therefore, changes in call loan rates did not cause changes in stock prices. The decline of the call loan rate in the dull seasons of late winter and midsummer did not cause the prices of stocks to be bid up, nor did the advance of the call loan rate in the spring and in the autumn cause any collapse or even decline of security values.

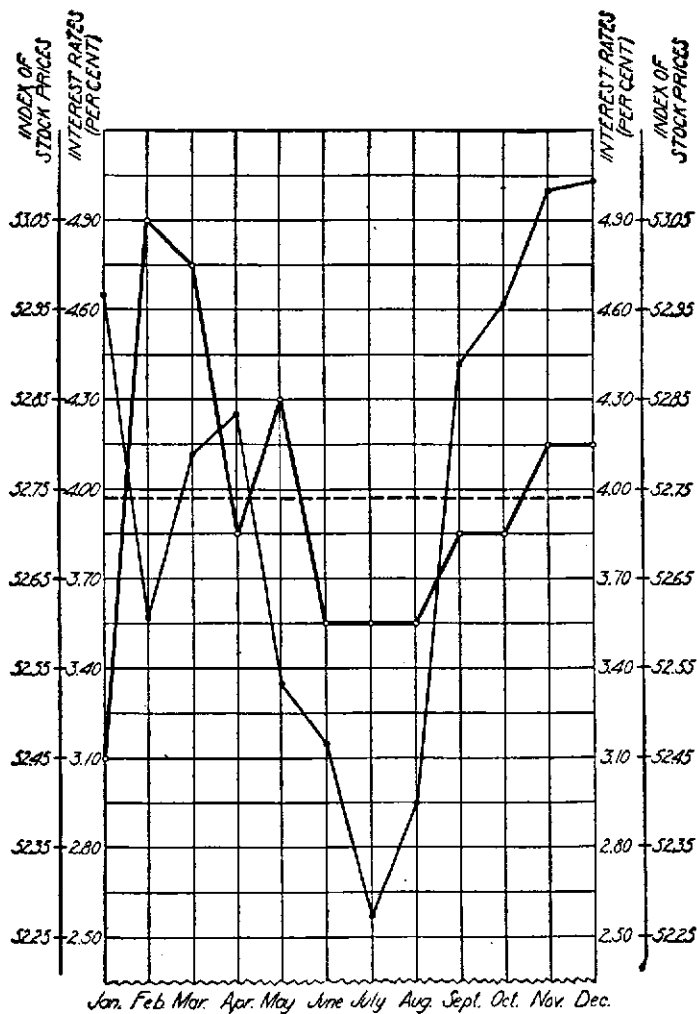
As a check on the results of the comparisons just described, we have made an examination of certain data relative to call loan rates and railroad stock

⁷ By secular trend is meant the long time tendency to increase or decrease, as contrasted with the fluctuations from day to day, from one season to another, or from one phase of the business cycle to another.

⁸ See p. 90 and Appendix J.

SEASONAL MOVEMENT OF INDUSTRIAL STOCK PRICES AND CALL LOAN RATES, 1872-1891.

The index numbers for stock prices are arithmetic averages of the twenty items for each calendar month. The index numbers for call loan rates are the medians of the twenty items for each month.



—●— Industrial Stock Prices —●— Call Loan Rates

--- Average of Stock Price Indexes (52.74) and of Interest Rates (3.97)

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prices, using the Frickey index of railroad stock prices described on pages 21-22.

Call loan rates showed a marked seasonal variation in the period from 1866 to 1880. The median rates for each month are shown below:

MEDIANS OF CALL LOAN RATES, JANUARY, 1866, TO DECEMBER, 1880.

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Median Rate	6.15	4.70	5.60	5.70	4.10	3.00	3.00	3.70	4.60	5.65	6.30	9.60

The seasons of high and low rates for the period from 1866 to 1880 are the same as for the period from 1872 to 1891. One season of high rates occurred in March and April and another lasted from September to December. Rates declined in January and February and were again low from May to August.

Railroad stock prices show no seasonal variation for the period from 1866 to 1880. The first average computed is the median, which is given below:

MEDIANS OF RAILROAD STOCK PRICES, JANUARY, 1866, TO DECEMBER, 1880.

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Median Price	100	102	99	96	97	100	100	105	102	110	108	106

The median prices are higher in the autumn than in other months. In other words, stock prices advanced during the season when call loan rates were the highest of the year. If this has any significance it is in direct contradiction to the accepted theory. Other tests, however, indicate that this situation was accidental and that stock prices during this period did not show any genuine seasonal variation.

Arithmetic averages of railroad stock prices for

the period from 1866 to 1880 show a remarkable regularity from month to month. These averages are shown in the accompanying table.

ARITHMETIC AVERAGES OF RAILROAD STOCK PRICES, JANUARY, 1866, TO DECEMBER, 1880.

Month Average Price	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	99.8	99.6	99.9	99.8	99.7	99.9	99.1	100.6	99.8	100.5	100.2	101.9

The averages for each month are so nearly the same as the average for the entire period (100) that no seasonal influence can be detected.⁹

Seasonal variations in call loan rates from 1866 to 1880 did not cause variations in stock prices. The variations in call loan rates were pronounced and the seasons distinct. Since there were no seasonal variations in stock prices, the seasonal variations in call loan rates cannot be said to have caused changes in stock prices during this period.

III. SEASONAL INFLUENCES TESTED BY THE METHOD OF LINK RELATIVES.

The Harvard Committee on Economic Research have tested certain periods for seasonal variations in call loan rates and in security prices, by computing link-relative indexes.¹⁰ Although the tests do not

⁹ When corrected for secular trend by averaging deviations from the straight line of best fit, these averages work out as follows:

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Average Price	98.68	98.80	99.40	99.04	99.40	99.52	99.04	100.84	100.36	100.84	100.84	102.88

(Computed from corrected data given in *Review of Economic Statistics*, Vol. II, 1920, July supplement, p. 33.)

¹⁰ For description of this method, see *Review of Economic Statistics*, January, 1919, Vol. I, pp. 18-31.

cover identical periods of time for the two series, the results are comparable.

The Harvard Committee have found a marked seasonal variation in call loan rates but no seasonal variation in stock prices. The Committee made tests for seasonal variation in call loan rates for the period from January, 1890, to January, 1917. The seasons of high and low rates which they found are clearly marked and are approximately the same as those found in our tests for the periods from 1866 to 1880, and from 1872 to 1891. The indexes computed by the Harvard Committee are given below:

MONTHLY INDEXES OF SEASONAL VARIATION IN CALL LOAN RATES, JANUARY, 1890,
TO JANUARY, 1917.*

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Index	110	83	89	91	87	80	81	80	104	119	124	150

* *Review of Economic Statistics, January, 1919, Vol. I, p. 63.*

The Committee also made a test for seasonal variation in stock prices, but the results were negative. This test covered the period from January, 1897, to January, 1914.¹¹ The two tests of the Harvard Committee, although not for identical periods of time, indicate that seasonal variations in call loan rates are not associated with seasonal variations in security prices.

IV. SEASONAL INFLUENCES TESTED BY DIRECT COMPARISON OF CONCURRENT CHANGES.

In the tests for seasonal variations in interest rates and in stock prices discussed in the preceding

¹¹ *Review of Economic Statistics, April, 1919, Vol. I, p. 147.*

sections of this chapter, a single average, or index, has been used for each month of the year. It might be argued, however, that the absence of any relationship between the averages is inconclusive. It might further be argued that *in some years* stock prices would fluctuate inversely with interest rates, without the relationships being clear in the averages. The data have, therefore, been examined year by year to determine how often a change in interest rates was accompanied by an inverse movement in stock prices.

The results of the comparisons will be found in the accompanying table, which shows for each month of the year the number of times in the 42 years (1872-1914), when an increase in call loan rates was accompanied by an advance, by a decline, and by no change, in stock prices. The same information is given for the months when interest rates declined.

The month-to-month changes indicate the seasonal variations in interest rates. In January, for example, the call loan rate declined from the December level in 38 of the 42 years. In February, also, the declines predominated, since the rate declined from January to February in 33 years and advanced in only nine. The other periods of declining and advancing rates also correspond with the periods of high and low rates previously disclosed by the use of an average rate for each month of the year.

The data do not indicate that the seasonal variations in interest rates caused inverse movements of

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stock prices. Of the 38 years when the call loan rate declined from December to January, for example, stock prices advanced in that month in only 14 years, declined in 15 and made no change in nine. Likewise, call loan rates declined in February in 33 of the 42 years, but stocks advanced in price in only 16 of the 33 years. Similar results will be noted for each of the other months of the year. The table shows clearly that an advance or decline of the call loan rate in any month is as likely to be accompanied by a similar movement in stock prices as by an inverse movement.

RELATION OF STOCK PRICES TO CHANGES IN CALL LOAN RATES, JANUARY, 1872, TO JANUARY, 1914.

(Number of months with concurrent changes as indicated.)

Month	Increase in Rates				Decrease in Rates				No Change in Rates Combined	Total
	Advance in Prices	Decline in Prices	No Change in Prices	Total	Advance in Prices	Decline in Prices	No Change in Prices	Total		
January	1	0	3	4	14	15	9	38	0	42
February	5	3	1	9	16	12	5	33	0	42
March	14	10	4	28	2	1	7	10	4	42
April	11	9	4	24	6	8	2	16	2	42
May	3	6	1	10	11	14	7	32	0	42
June	4	5	1	10	10	14	7	31	1	42
July	4	5	5	14	10	8	7	25	3	42
August	11	3	3	22	9	6	3	18	2	42
September	11	11	9	30	6	2	3	11	1	42
October	9	10	10	29	4	6	2	12	1	42
November	15	8	3	26	3	7	6	16	0	42
December	10	13	10	33	3	4	2	9	0	42
Total	98	88	53	239	94	97	60	251	14	504

Tests for seasonal variation in call loan rates and in stock prices have now been made for three different periods between 1866 and 1917 and for the

entire period from 1872 to 1914. All these tests show a pronounced seasonal movement in call loan rates, with the seasons of high and low rates the same in all periods. On the other hand, no test made for any period shows a seasonal movement in stock prices. We conclude, therefore, that seasonal movements of interest rates do not cause seasonal movements in stock prices.

V. SEASONAL VARIATION IN CALL LOAN RATES AND IN THE VOLUME OF SALES OF STOCKS.

Even though seasonal variations in call loan rates do not cause seasonal variations in security prices, it might be contended that they cause seasonal variations in the volume of sales of stocks. The relation of variations in interest rates to seasonal variations in the volume of sales has, therefore, been tested.

It has already been shown that call loan rates have a marked seasonal variation. If the variations in interest rates cause variations in the volume of sales, the seasons of high rates should be seasons of small volume of sales, while seasons of low rates should be seasons of large volume of sales.

The variations in the volume of sales of stocks are in direct contradiction to the accepted theory. The Harvard Committee have computed monthly indexes of variation in the number of shares sold on the New York Stock Exchange.¹² The data used

¹²It should be noted that the Harvard Committee are not convinced that these indexes reflect a true seasonal movement in the volume of sales of stocks, as the variations are not uniform

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are for the period from January, 1903, to January, 1917. In the accompanying table and in the chart on page 35 these indexes are compared with the Harvard Committee's indexes of seasonal variation in the rate on call loans.

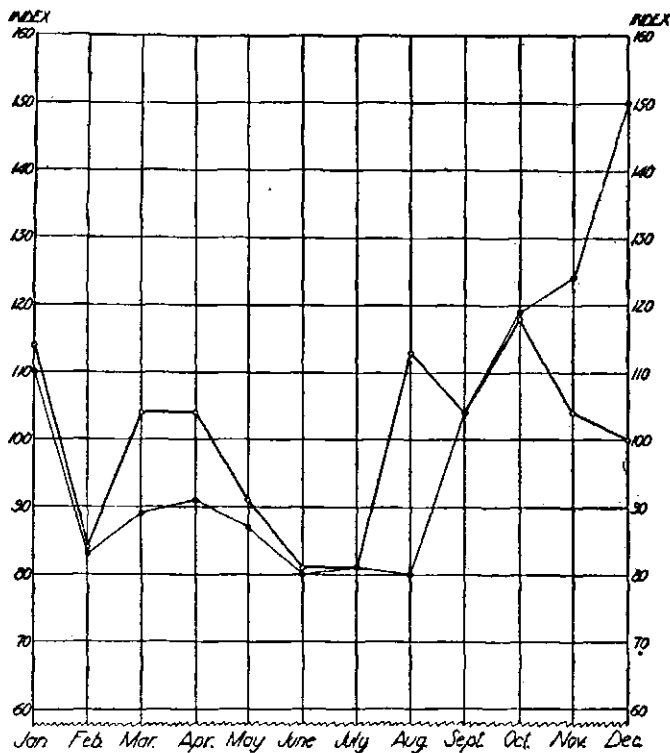
MONTHLY INDEXES OF VARIATION IN CALL LOAN RATES AND IN NUMBER OF SHARES SOLD ON THE NEW YORK STOCK EXCHANGE.*

Month	Call Loan Rates	Shares Sold
January	110	114
February	83	84
March	89	104
April	91	104
May	87	91
June	80	81
July	81	81
August	80	113
September	104	104
October	119	118
November	124	104
December	150	100

* These indexes are not based on data for identical periods. The index for call loan rates is based on the period from January, 1890, to January, 1917, while that for the volume of sales is based on the period from January, 1903, to January, 1917. *Review of Economic Statistics*, January, 1919, Vol. I, pp. 57-63.

A high interest rate is not accompanied by a small volume of sales, nor is a low interest rate accompanied by a large volume of sales. In January the volume of sales is very large in spite of a comparatively high interest rate; for though the call loan rate shows a decline from December it is still from one year to another. Comparison of the indexes with the results of Mr. Thompson's investigation and with our own, described below, leads us to accept them as significant, however.

SEASONAL MOVEMENT OF CALL LOAN RATES AND VOLUME OF STOCK EXCHANGE TRADE.



Indexes of Month to Month Variation:

—◆— Number of Shares Sold, 1903-16

—■— Call Loan Rates, 1890-1916

well above the average for the year. In February the volume of sales and the call loan rate decline together, and in March and April they rise together. The summer months are characterized by low inter-

est rates and a small volume of sales. August is the only month when the theory under discussion may appear to receive support from the data. The later months of the year are marked by sharply rising rates for call loans and also by an increased volume of sales.¹³

An independent investigation of the relation of the rate on call loans to the volume of sales of stocks has been made by L. D. Thompson.¹⁴ He computed arithmetic averages of the number of sales made in a working day, for the period from January, 1890, to December, 1920. Mr. Thompson summarizes the results as follows:

"The call rate and volume of sales tend to fluctuate together. The year starts out on a plane lower than that of the preceding December. The month of February witnesses decreases in both rates and share sales. During the next three months, March, April, and May, both the rate and the volume of sales are on a higher level. While rates have begun to decline in May, sales hold up throughout this month. Sales in June and July are much below the average, while rates touch a low point in June and increase slightly in July.

"In August sales take a rapid turn upward and rates recede slightly. But by September rates have joined the upward swing and continue to increase throughout the year. Meanwhile the volume of transactions increases to the high point which is touched in November. In December transactions decline but still are at a much higher point than in October."¹⁵

¹³ The coefficient of correlation of the two series is + .443.

¹⁴ Thompson, Lorenzo D., *The Relation of Call Money Rates to Stock Market Speculation*. Submitted to the faculty of the University of Chicago in candidacy for the degree of Master of Arts, September, 1922 (unpublished).

¹⁵ *Ibid.*, p. 44.

The indexes of monthly variations in the volume of sales computed by the Harvard Committee and the arithmetic averages computed by Mr. Thompson disagree in some details, but both indicate that the largest volume of sales is attained in the months of high rates on call loans and the smallest volume of sales is made in the months of low rates.

It was pointed out earlier in this chapter, however, that a comparison of monthly averages is not conclusive evidence of the lack of inverse relationship between the two series, since it does not indicate whether the fluctuations are uniform from year to year; nor does it show whether year by year the fluctuations in the one correspond to changes in the other. It is necessary, therefore, to compare the month-to-month variations in the volume of sales of stocks with corresponding variations in the call loan rates. The method here used is the same as that previously employed in comparing the month-to-month variations in stock prices and in call loan rates. The results of the comparison of monthly fluctuations from January, 1881, to January, 1914, are shown in the table on page 38. The data are given in Appendix D.

The seasonal variation in the call loan rate is again indicated. By comparing the number of increases in the rate in each month with the number of decreases, the reader will see that the seasons of declining and advancing rates are the same seasons that were found by previous tests.

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RELATION OF THE VOLUME OF SALES OF STOCKS TO CHANGES IN THE CALL LOAN RATE, JANUARY, 1881, TO JANUARY, 1914.

(Number of months with concurrent changes as indicated.)

Month	Increase in Rates			Decline in Rates			No Change in Rates	Combined Total
	Increase in Volume	Decrease in Volume	Total	Increase in Volume	Decrease in Volume	Total		
January ...	1	1	2	17	14	31	0	33
February ...	1	5	6	8	19	27	0	33
March ...	13	6	19	4	4	8	6	33
April ...	10	8	18	4	9	13	2	33
May ...	6	4	10	9	14	23	0	33
June ...	5	5	10	5	17	22	1	33
July ...	4	8	12	6	12	18	3	33
August ...	10	6	16	9	6	15	2	33
September ...	11	14	25	5	2	7	1	33
October ...	15	6	21	6	5	11	1	33
November ...	11	9	20	3	10	13	0	33
December ...	17	10	27	1	5	6	0	33
Total ...	104	82	186	77	117	194	16	396

A tendency exists for a large volume of sales to be made in months of high rates, and for a small volume of sales to be made in months of low rates. The figures for January and for September indicate a slight tendency for the volume of sales to move in the direction called for by the theory under review. The call rate declined in January, as compared with the preceding December, in 31 of the 33 years. In 17 of those years, the volume of sales increased in January, and in 14 years it decreased. Of the two years when the call rate advanced in January, the volume of sales increased in one year and decreased in the other. In September the rates and the volume of trade changed in opposite directions 19 times out of 33. In all other months, however, the results contradict the theory. In February, there was usually a decline in the rate accompanied by a

decrease in the volume of shares traded, while in March and April there was most frequently an advance in the rate accompanied by an increase in the volume of shares sold. In May, June, and July, a decrease in the rate and a decline in the volume of trade usually went together. In August and in all the months after September the volume of sales tended to increase regardless of whether the call rate advanced or declined.

The extent to which the data support the theory may now be summarized. The number of times for each month when the call loan rate and the volume of sales moved in the same direction, the number of times when they moved in opposite directions, and the number of times when the call loan rate was unchanged, are shown in the table on page 40.¹⁶

The arithmetic averages of call loan rates and of the volume of sales, the monthly indexes of variation, and the month by month comparison of changes all indicate that a high call loan rate and a large volume of sales tended to occur together, and that a low call loan rate and a small volume of

¹⁶ No allowance has been made for the greater number of trading days in some months than in others. February, for example, is the shortest month of the year and also has two holidays. The volume of sales for that month would therefore show a decrease as compared with January, even though the sales per day were as large. For the same reason the volume of sales for March should show an increase over February. The results for other months, however, are not seriously affected by the varying length of the month, and if the results for February and March are entirely disregarded, the findings still clearly contradict the theory.

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RELATION OF CHANGES IN THE CALL LOAN RATE AND IN THE VOLUME OF SALES OF STOCKS, BY MONTHS, JANUARY, 1881, TO JANUARY, 1914.

Month	Number of Changes in both Variables in		Call Rate Unchanged
	Same Direction	Opposite Direction	
January	15	18	0
February	20	13	0
March	17	10	6
April	19	12	2
May	20	13	0
June	22	10	1
July	16	14	3
August	16	15	2
September	13	19	1
October	20	12	1
November	21	12	0
December	22	11	0
TOTAL	221	159	16

sales tended to occur together. Since the results are similar by whatever method the data be tested, the unsoundness of the accepted theory seems to be clearly established.¹⁷

The relation of the monthly variations in call loan rates to monthly variations in the volume of sales lends support to the idea that the rate for call loans

¹⁷ Testimony before the Committee on Banking and Currency in the Money Trust investigation was to the effect that both banks and money brokers made the largest volume of loans for stock exchange purposes when call loan rates were high and that they made the smallest volume of loans in the vacation season when speculators and traders were out of the city and rates were low. See testimony of J. H. Griesel, member of firm of commission brokers in New York; *Money Trust Investigation*, United States Government Document, 1913, part 10, p. 744. Also testimony of J. B. Niven, public accountant, *ibid.*, part 13, pp. 955-7.

is a *result* rather than a *cause*. When the volume of sales is large, there is a greater demand for funds, which appears to cause a higher rate. The summer months are a period of slackness in business, and also a period of dullness on the stock exchanges.

If a low call loan rate stimulates speculation in stocks and a high call loan rate curtails speculation, the results should be observable both in the prices of securities and in the volume of sales. The rate for call loans has been tested for seasonal variation by three methods and for three different periods, 1866-80, 1872-91, 1890-1917, and also for the entire period from 1872 to 1914. In each of these tests a marked seasonal variation in call loan rates is found, and the seasons of high and low rates are the same in all the periods. Prices of stocks have also been analyzed by three methods for the same periods, and not the slightest evidence of seasonal variation has been found. Prices of stocks do not fluctuate according to the seasons of the year. The volume of sales of stocks has been tested for seasonal variation by three independent investigations. All the results indicate a monthly variation in the volume of sales, but the nature of the variation is such that it contradicts the theory which we are examining. Seasonal changes in call loan rates clearly do not cause seasonal variations either in stock prices or in the volume of sales of stocks.

CHAPTER III

DAY-TO-DAY VARIATIONS IN CALL LOAN RATES AND IN SPECULATIVE ACTIVITY

OUR study and conclusions concerning the soundness of the accepted theory in its application to seasonal variations have been based on analyses of monthly data. In view of the fact, however, that each of the variables involved—the call loan rate, the general level of security prices, and the volume of shares traded in—changes from day to day, it might be expected, provided the theory is valid, that the day-to-day fluctuations in interest rates would show some definite relationship to the concurrent fluctuations of speculation. It has seemed desirable, therefore, to make a comparison of the daily changes in the call loan rate with those which occur concurrently in the prices of securities and in the volume of trade.

Such a comparison is made possible through data published in the *Wall Street Journal*. A daily average of stock prices (the Dow-Jones average) has been published by that paper covering the period since January, 1897. The call loan renewal rate and the volume of sales on the New York Stock

Exchange are also published by the *Journal* for each business day.

It was decided to test the theory by examining an irregular market, a bull market, and a bear market. Data for call loan rates, the volume of sales of industrial stocks, and the average of stock prices by days, have been compiled for the period from January to August, 1906, and for the entire years 1908 and 1910. The data are given in full in Appendix E.

I. DAY-TO-DAY VARIATIONS IN THE CALL LOAN RATE AND IN SECURITY PRICES.

The rate on call loans for each day has been compared with the rate for the preceding day to determine whether there was an advance or a decline. The same comparison has been made for security prices.

The results are shown in the accompanying table for each of the 32 months for which the comparison was made. This table shows for each month the number of days when an increase in the rate was accompanied by an increase in security prices, and the number of days when an increase in the interest rate was accompanied by a decrease in security prices. The same information is given for days when the rate decreased and for days when the rate was unchanged. The table also shows the relationship between the monthly net changes in call rates and in stock prices.

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RELATION OF SECURITY PRICES TO CHANGES IN THE CALL LOAN RATE.

Month	Number of days showing specified concurrent changes						Net change for the month	
	Rate Advance		Rate Decline		Rate Unchanged		Call Loan Rate	Security Prices
	Price Advance	Price Decline	Price Advance	Price Decline	Price Advance	Price Decline		
1906								
January	6	1	9	3	2	4	Decline	Advance
February	3	6	5	3	1	4	Advance	Decline
March	5	5	6	4	3	4	Decline	Advance
April	4	9	3	3	2	4	Decline	Decline
May	5	3	4	4	6	4	No change	Advance
June	3	4	2	3	5	9	Advance	Decline
July	5	5	2	2	5	3	Decline	Advance
August	5	8	5	0	5	4	Advance	Decline
Total	36	41	39	22	29	36		
1908								
January	1	1	7	4	7	5	Decline	Advance
February	1	2	3	1	6	10	Decline	Decline
March	4	0	1	3	14	4	No change	Advance
April	4	0	0	3	9	8	No change	Advance
May	3	1	3	1	10	7	No change	Advance
June	0	2	2	2	11	9	Decline	Decline
July	1	1	2	0	17	5	Decline	Advance
August	0	1	0	1	18	6	No change	Advance
September	2	2	1	1	7	11	Advance	Decline
October	4	2	4	3	7	7	Decline	Advance
November	2	1	1	1	8	10	Advance	Advance
December	4	3	3	1	4	10	Advance	Decline
Total	24	16	27	21	118	92		
1910								
January	1	1	5	8	6	3	Decline	Decline
February	4	2	1	2	9	4	Advance	Advance
March	1	2	3	0	10	9	No change	Decline
April ^a	3	2	3	4	6	6	Advance	Decline
May	1	4	4	4	7	4	No change	Advance
June ^b	1	3	2	2	10	7	Decline	Decline
July	2	2	5	3	4	8	Decline	Decline
August	2	3	1	4	10	7	Decline	Advance
September	3	4	2	1	7	7	Advance	Advance
October	1	2	4	0	11	7	Advance	Advance
November	3	2	5	5	6	8	Decline	Decline
December	3	6	2	3	7	4	Advance	Decline
Total	25	33	37	36	93	74		
Grand Total.	85	90	103	79	240	202		

^a In April, 1910, prices were unchanged on two days. On one of those days the call loan rate advanced; on the other the rate was unchanged.

^b On one day in June, 1910, both the rate and the average price were unchanged.

An increase in the rate on call loans from one day to another did not characteristically cause a decline of stock prices. During the first eight months of 1906, the rate on call loans advanced on 77 days. On 36 of those days stock prices also advanced, and on 41 they declined. Thus in a slight majority of cases the relationship between the rates and the price changes was what the accepted theory would lead one to expect.

In 1908, however, in the majority of cases the theory was not substantiated. The rate advanced on 40 days, and on 24 of these the stock prices advanced also.

In 1910 the facts were again in harmony with the theory in a small majority of cases. The call loan rate advanced on 59 days. On 25 of those days, the average of stock prices advanced; on 33 days it declined, and on one day it remained unchanged.

During the three periods considered, the call loan rate advanced on 176 days. The prices of stocks advanced on 85 of those days, declined on 90 days, and remained stationary on one day. So far as the data indicate, the relationship between daily call loan rates and daily averages of stock prices was entirely a matter of chance.

A decrease in the call loan rate was in a small majority of instances accompanied by an advance in security prices. During the first eight months of 1906, the rate decreased on 61 days. On 39 of those days the prices of securities advanced and on 22 days

they declined. For 1908 the results were approximately the same as for 1906. The rate declined on 48 days; on 27 of those days prices advanced and on 21 they declined. In 1910 the rate declined on 73 days; 37 of these declines were accompanied by stock price advances, and 36 by declines.

The results for the entire period (802 days) for which comparisons were made may be summarized as follows:

The call loan rate and security prices moved in opposite directions on 193 days.

The call loan rate and security prices moved in the same direction on 164 days.

Either the call loan rate or the average of security prices was unchanged on 445 days.

While a majority of cases are in accord with the theory under review, there are so many exceptions that the results afford no real support to the theory. They may easily have been due to chance.¹

The supposed advance in security prices on the days when the call loan rate declined is usually attributed to increased purchases of securities. Before

¹This conclusion is confirmed by correlation tests. Correlation coefficients of call loan rates and industrial stock prices were computed for each of the years for which the data were collected. For the first eight months of 1906 the data were correlated without adjustment. The coefficient of correlation for that period is +.254. For the years 1908 and 1910, the trend was eliminated from both series by the computation of first differences, these differences then being used in computing the coefficients of correlation. The resulting values are +.122 for 1908 and +.037 for 1910. These results contradict the accepted theory, which would call for a negative or inverse correlation.

the question is finally decided, it is necessary, therefore, to examine the day-by-day record of the volume of trading on the Stock Exchange.

II. DAY-TO-DAY VARIATIONS IN THE CALL LOAN RATE AND IN THE VOLUME OF SALES OF STOCKS.

The comparison of daily variations in the rate for call loans with variations in the volume of sales for an extended period cannot be made on quite the same basis as the comparison of changes of rates with changes of security prices. The Stock Exchange closes at 12 o'clock on Saturday; hence the volume of sales on Saturdays is not directly comparable with the volume of sales on other days. Nor can it be assumed that the volume of sales per hour on Saturday is comparable with the volume of sales per hour on other days. For this reason it was decided to disregard Saturdays entirely and to compare the volume of sales on Monday with the volume on the preceding Friday. Likewise, of course, the call loan rate on Monday has been compared with the rate on Friday. The accompanying table shows the results.

A day-to-day increase in the call loan rate did not cause a corresponding decrease in the volume of sales of stocks. In the first eight months of 1906 the call loan rate increased on 72 days. On 39 of those days the volume of sales also increased, and on 33 days it declined. In 1908 the call loan rate increased on 42 days. The volume of sales of stocks showed an

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RELATION OF VOLUME OF SALES OF STOCKS TO CHANGES IN THE CALL LOAN RATE.
(Number of days with concurrent changes as specified.)

Month	Increase in Rates		Decrease in Rates		No Change in Rates	
	Increased Volume of Sales	Decreased Volume of Sales	Increased Volume of Sales	Decreased Volume of Sales	Increased Volume of Sales	Decreased Volume of Sales
1906						
January	5	2	5	7	0	2
February	8	1	3	5	0	1
March	6	3	6	4	0	3
April	2	8	4	3	3	0
May	5	3	5	3	1	5
June	2	4	2	3	6	4
July	6	4	3	4	0	4
August	5	8	2	3	3	2
Total	39	33	30	32	13	21
1908						
January	1	1	5	7	2	5
February	3	0	1	3	4	8
March	1	3	3	0	6	8
April	3	2	0	2	7	7
May	2	2	1	3	5	7
June	1	1	1	2	7	9
July	0	1	1	0	8	11
August	0	1	0	1	8	10
September	1	3	1	1	9	6
October	3	3	2	5	4	5
November *	1	2	1	1	7	6
December	4	3	1	3	5	5
Total	20	22	17	28	72	87
1910						
January	0	2	7	5	2	4
February	2	4	2	1	6	4
March	2	1	1	2	9	7
April	4	2	4	3	4	4
May *	3	2	3	5	2	5
June	3	1	3	1	5	9
July	2	2	2	6	5	8
August	2	3	0	5	6	7
September	6	1	1	3	6	4
October	2	1	3	1	6	7
November	3	3	4	5	3	2
December	6	3	2	3	2	5
Total	35	25	32	40	56	66
Grand Total.	94	80	79	100	141	174

* Both call loan rates and volume of sales were unchanged on one day in November, 1908, and on one day in May, 1910.

increase on 20 of those days and a decline on 22. In 1910 the call loan rate increased on 60 days; the volume of sales increased on 35 of those days and declined on 25.

In the three periods for which comparisons have been made, the call loan rate increased on 174 days. The volume of sales increased on 94 of those days and decreased on 80. The tendency for all the periods combined was, therefore, slightly in the direction opposite to that indicated by the theory which we are testing.

A day-to-day decrease in the call loan rate did not cause an increase in the volume of sales of stocks. For each period for which data have been compiled, the results are contradictory to the theory. In 1906 a decrease in the call loan rate was accompanied on 32 days by a decrease in the volume of sales, and on 30 days by an increase. In 1908 the call loan rate and the volume of sales decreased together on 28 days, while on 17 days a decrease in rates was accompanied by an increase in the number of shares sold. In 1910 both the rate and the volume of sales decreased on 40 days, while on 32 days a decrease in the rate coincided with an increase in the number of shares sold. In the three periods considered, the call loan rate decreased on a total of 179 days. On 79 of these days the number of shares sold showed an increase over the preceding day, and on 100 it decreased.

The results for the entire period (690 days) may,

therefore, be summarized to indicate the extent to which the data support the orthodox theory:

The call loan rate and the volume of sales moved in the same direction on 194 days. The call loan rate and the volume of sales moved in opposite directions on 179 days. Either the call loan rate or the volume of sales remained unchanged on 317 days.²

The results of the comparison of day-to-day changes in the call loan rate with day-to-day changes in the volume of sales of stocks clearly lend no support to the theory under review.

²The coefficient of correlation for the call loan rate and the volume of sales was computed for the first eight months of 1906. The degree of correlation is + .139.

CHAPTER IV

LOW CALL LOAN RATES AND CYCLICAL VARIATIONS IN SPECULATION

As was indicated in Chapter I, the generally accepted theory of the relation of interest rates to stock speculation deals both with seasonal changes in interest rates and with the major changes which run through the phases of a business cycle. Having tested the theory as applied to the seasonal variations and to day-to-day changes, we turn now to a consideration of the longer swings in interest rates and in speculative activity. For this purpose we shall examine the data for the years from 1872 to 1922. In order to simplify the analysis we shall discuss separately the relation of call loan rates to speculative activity in periods of low and high interest rates. In Chapter V we shall deal with periods of high rates. The relationship between the short time commercial paper market and the stock market will be analyzed in Chapter VI.¹

¹In these three chapters we shall test the more usual theory of changes in speculative activity but not the theory advocated by the Harvard Committee on Economic Research. The Committee found definite cycles in stock prices but no cycles in call loan rates (see *Review of Economic Statistics*, January, 1919, Vol. I, p. 48). The variant of the theory adhered to by the Harvard Committee is discussed in Chapter VII.

Data used in Chapters IV and V are the same averages of industrial stock prices and call loan rates, and total figures of number of shares sold on the New York Stock Exchange, which were used in Chapter II. The data are given in Appendices A, B, and D, and are shown graphically in the chart opposite p. 53.

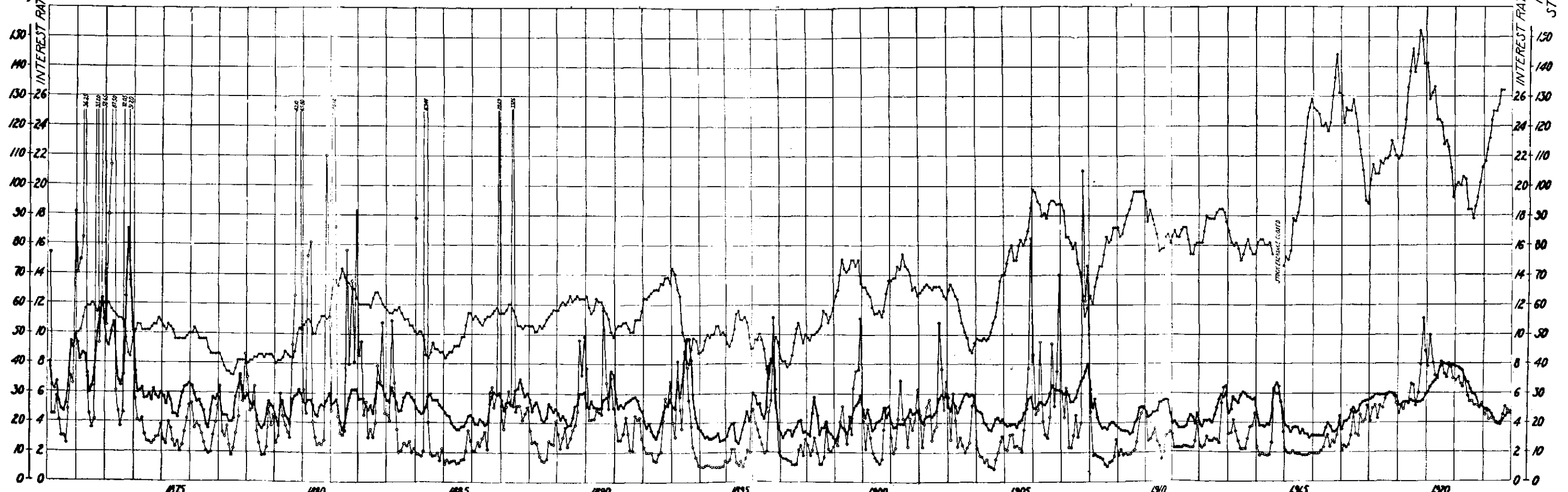
The median was chosen as the best base for determining what rates should be considered high or low.² The median monthly rate on call loans for the period from 1872 to 1922 is 3.30 per cent. Rates below this figure are classified as low; those above it as high. Very short interruptions in periods of high or low rates are disregarded, since previous comparisons have shown that minor changes in call loan rates do not cause variations in speculation.

The recovery of stock prices is dated from the month when the average of prices is lowest and the decline from the month when it is highest. Since the exact turning point of prices may occur in the month before or the month after the one in which the average is lowest, daily averages would be necessary in order to determine the exact turning

²It was noted in Chapter II that the median has a marked advantage over the arithmetic mean as an average for call loan rates in that it is not affected by the extreme height of the rates for certain periods. The arithmetic mean of the monthly call loan rates for the period from 1872 to 1922 is 5.21 per cent. In only 143 months of the period was the monthly average rate higher than 5.21 per cent, while in 469 months the average was lower than that figure. It is possible to use one rate as typical for the entire period because the call loan rate shows no long time tendency either to advance or to decline.

INDEX OF STOCK PRICES (PER CENT)

INDEX OF STOCK PRICES



Index of Industrial Stock Prices (New York Stock Exchange)

Call Loan Rates

Rates on Prime Commercial Paper

INTEREST RATES AND INDUSTRIAL STOCK PRICES, 1871-1922.

points. As such data are lacking for most of the period under examination, the recoveries and declines are dated from the months of lowest or highest averages. In the few cases when the highest or lowest monthly average was maintained for two or more months, the turning point is considered to be the last of these months. In this chapter we shall consider first stock prices and then volume of sales.

I. LOW CALL LOAN RATES AND STOCK PRICES.

Our survey of periods of low interest rates begins with the depression following the panic of 1873, which was one of the most prolonged and acute money market depressions the United States has ever experienced.

*In the depressed money market following the crisis of 1873 nearly four years elapsed before industrial stock prices began a major advance.*³ The crisis occurred in September, 1873. Stock prices did not reach their lowest point till July, 1877, 46 months after the panic. During this long period of falling stock prices the level of call loan rates had no visible effect upon speculation. From May, 1874, to October, 1875, a period of 18 months, call loan rates remained almost continuously below the median rate

³ For this period the median of rates from 1872 to 1922 is a somewhat inappropriate standard. As compared with the rates charged for at least seven years before the crisis, the rates of 1874-78 were continuously very low. So far as their influence on speculation is concerned they must, therefore, be regarded as low, although when judged by the levels of later years they were moderately high for a good share of the time.

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of 3.30 per cent. At the end of that time the average of stock prices was lower than it had been when the period of low rates began.

After a six-months period of relatively tight money, call loan rates again declined to less than 3.30 per cent in May, 1876. This time rates remained low for six months, and no advance in stock prices is recorded for any month during this period. For May, the average of stock prices was 48; for October, the last month of low rates, it was 43.

A period of low rates in 1877 was marked first by a considerable decline in stock prices, and later by the beginning of a recovery. Call loan rates were low in 1877 from February to August, a period of seven months. Stock prices lost seven points during the first five months of the period. The low point of call loan rates was reached in June, and that of stock prices in July. The recovery, therefore, began while rates were low, but were beginning to advance. In September the call loan rate rose to an average of 4.35 per cent, and the average price of stocks advanced to 41 as compared with 36 in July. The average of 41 points was maintained throughout the remaining months of the year despite high and advancing call loan rates. The greatest recovery of stock prices following the crisis of 1873 began in the autumn of 1879 when call loan rates were very high. This advance continued through another short period of low rates in 1880.

In the next period of low rates 19 months elapsed

before stock prices turned upward. Interest rates fell below the median in June, 1883, and remained very low for three years, except for a flurry in May and June, 1884. Stock prices were already declining and showed no rallying power until January, 1885, when a gradual advance began which continued through the remainder of the period of low rates.

The recovery of stock prices in April, 1888, was preceded by two months of low call loan rates. The rates reached a low point in February, 1888, and remained low until June, 1889. The advance of stock prices beginning in April, 1888, continued until January, 1890.

During the next period of low rates there occurred only minor changes in stock prices. The low point in the stock index occurred in December, 1890. In that month the call loan rate averaged 5 per cent. Rates dropped below the median in February, 1891, and remained low for seven months. During this period stock prices made a slight advance and then lost most of the gain. In the period from December, 1891, to August, 1892, rates were low, while stock prices advanced nine points.

Both advances and declines of stock prices were made in a period of very low call loan rates in 1894 and 1895. After the panic of 1893 call loan rates were very low. The rate in October, 1893, averaged 2.38 per cent, and after that month it averaged less than 2 per cent for 16 successive months. Between December, 1893, and February, 1895, there was an

advance in stock prices of nine points, succeeded by a decline of seven points. Again in 1895 a similar movement occurred; stock prices advanced 12 points in the first half of the year and then declined 13 points. The rate in June when the decline began was only 1.16 per cent, and the highest average rate for any month for a year and a half before the decline was 2.25 per cent.

Again in 1896 stock prices collapsed in spite of low interest rates. During the first three months of the year call loan rates ruled above the median, and stock prices advanced three points. From April to August, with interest rates at a low level, the stock index slumped from 50 to 35. During the period of high call rates in September, October, and November, stocks recovered almost all of this loss.

The recovery of stock prices in April, 1897, was preceded by four months of low call loan rates. After the high interest rates of the autumn of 1896, call loan rates declined to an average of 1.95 per cent in December and remained low for over two years. Stock prices began a major advance in April, 1897.

In 1900 call loan rates were low continuously from April to September. The only considerable advance of stock prices in that year was made, not during this period of low interest rates, but in the autumn when rates were once more advancing.

The long period of low rates in 1903, 1904, and 1905 was accompanied first by a decline and then by an advance in stock prices. Call rates declined

to 2.44 per cent in May, 1903, and remained low until November. Stock prices declined 17 points during this period of low rates. In November and December the rates temporarily went above 5 per cent, and at the same time stock prices began to advance. For the next year and a half low rates and advancing stock prices went together.

The prolonged period of low rates in 1908-1909 was accompanied by advancing stock prices, but the advance in stock prices began three months before interest rates became low. Stock prices reached their minimum in the panic month of November, 1907, and then turned upward, the index figure advancing from 56 to 98 in less than two years. Interest rates averaged 12.25 per cent in November and 14.60 per cent in December, 1907, but dropped below the median in February, 1908, and remained low until October, 1909.

The period of low call loan rates which began in February, 1910, continued for 20 months before a major upturn of stock prices occurred. Stock prices turned downward in December, 1909. Call rates declined to 2.78 per cent in February, 1910, and remained low throughout the ensuing decline of stock prices. A major recovery in stocks did not begin until October, 1911.

Nineteen months of low call rates in 1913 and 1914 failed to stop the decline of stock prices. Stock prices had turned downward in October, 1912. This decline continued until the outbreak of war in July,

1914, when the Stock Exchange closed its doors. In January, 1913, the call rate averaged only 3.23 per cent, and it continued to be low during most of the time until the war began. The highest monthly average rate during the period was 4.63. In only one other month during this long period did the rate average more than 4 per cent. Yet in spite of the low rates, the stock market had shown no signs of recovery when war began.

Call loan rates do not explain the movements of stock prices from 1915 to 1917. Throughout the period from January, 1915, until August, 1917, with the exception of two months, rates remained below the median. During the first part of this long period of low rates stock prices advanced rapidly. The latter part of the period was marked by three distinct breaks in stock prices, each of considerable proportions. These breaks occurred in December, 1915; November, 1916; and June, 1917. The call rates for these months averaged 1.94 per cent, 3.13 per cent, and 4.69 per cent, respectively. Obviously, the movement of stock prices during this period cannot be accounted for by the level of rates on call loans.

We may now summarize the movements of stock prices during periods of low call loan rates.⁴ Dur-

⁴It should be remembered that the lengths of the periods of low call loan rates can be approximated only, and that minor fluctuations are necessarily disregarded. Moreover, at least one recovery of stock prices, that of December, 1890, might have been dated from a different month.

ing the period covered by the index of industrial stock prices there were 17 periods of low rates of four months duration or more. Major advances in stock prices began in seven of these. The essential facts regarding these seven cases are shown in the following table:

PERIODS OF LOW CALL LOAN RATES MARKED BY BEGINNINGS OF MAJOR RECOVERIES IN STOCK PRICES.*

Beginning of Low Rates	Beginning of Recovery of Stock Prices	Interval (months)
February, 1877	July, 1877	5
June, 1883	January, 1885	19 *
February, 1888	April, 1888	2
October, 1893 ^b	{ January, 1894	3
	{ February, 1895	16
December, 1896	April, 1897	4
April, 1900	September, 1900	5
February, 1910	October, 1911	20

* Any rate below 3.30, the median rate for the period, is considered low.

^a The high rates of May and June, 1884, are disregarded.

^b In the period of low rates from October, 1893, to November, 1895, stock prices made two distinct advances, with a 7-point decline between them.

The recoveries of stock prices which began in periods of low rates are the cases relied upon by proponents of the accepted theory. The great variation in the length of the preceding period of low call loan rates, however, is a strong indication that low rates were not the principal cause of these advances. If two months of low rates were sufficient to stimulate speculation in 1888, 20 months of low rates should not have been required in 1910-11. In fact, if low

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rates are the stimulus, the increase in speculation should, according to the logic of the theory, follow immediately upon the decline of the call loan interest rate.

Four periods of low call loan rates were marked by the continuation of declines in stock prices which had begun during preceding periods of high rates. These cases are shown in the following table:

PERIODS OF LOW CALL LOAN RATES MARKED BY CONTINUATION OF DECLINES OF STOCK PRICES.

Beginning of Period	End of Period	Length of Period (months)
May, 1874	October, 1875	18
May, 1876	October, 1876	6
April, 1896	July, 1896	4
January, 1913	July, 1914	19

Four periods of low call loan rates were marked by the continuation of advances in stock prices. These periods are shown in the following table:

PERIODS OF LOW CALL LOAN RATES MARKED BY CONTINUATION OF ADVANCES IN STOCK PRICES.

Beginning of Period	End of Period	Length of Period (months)
June, 1880	October, 1880	5
December, 1891	August, 1892	9
May, 1903	August, 1905	28
February, 1908	September, 1909	20

The period of low rates from June, 1878, to September, 1878, was marked by minor fluctuations within a range of a single point. The period of low rates from January, 1915, to August, 1917, was accompanied first by a great advance and then by a sharp decline.

It is impossible to find in these data any support for the theory that low call loan rates are a direct cause of advancing stock prices. Of the 15 major recoveries of stock prices between 1872 and 1922, only eight were immediately preceded by periods of low call loan rates. The lengths of these periods varied from two months to 20 months. Two recoveries began a short time before call rates became low. One began in a month of high rates following close after periods of low rates. Four were neither immediately preceded nor immediately followed by periods of low rates. In addition it should be noted that five periods of low rates for call loans began and ended without any improvement in stock prices. Clearly low rates are not necessary for an advance in stock prices; nor are they always followed by an advance.

II. RELATION OF LOW INTEREST RATES TO THE VOLUME OF SALES OF STOCKS.

So far in our argument the revival of speculation has been dated by the recovery of stock *prices*. Sometimes, however, an increase in the *volume* of trading on the New York Stock Exchange is con-

sidered to be an index of the revival of speculation; hence, the question arises whether it is necessary to check our conclusions by the use of data relative to the number of shares traded.

For several reasons we have deemed it unnecessary to make a detailed analysis of this angle of the question. In the first place, the changes in the volume of stock exchange trading are so extremely irregular that it would be impossible to make a detailed analysis of the sort we have just completed with reference to stock prices. In the second place, it is known that the volume of trade at the stock exchange shows a positive correlation with the prices of industrial stocks,⁵ so that any close relationship between interest rates and the volume of trade would necessarily be paralleled by a relationship between interest rates and the level of stock prices. In the third place, the movement of the prices of securities is, in our judgment, a much more accurate measure of speculative sentiment than is the number of shares sold.⁶ For these reasons we shall not undertake a detailed comparison of the changes in the call loan rate and the volume of stock trading.

Reference has already been made to L. D. Thomp-

⁵ *Review of Economic Statistics*, April, 1919, Vol. I, p. 185.

⁶ The Harvard Committee formerly included data for the volume of sales of securities on the New York Stock Exchange in computing their Curve A, Speculation. Recently they have dropped these data from their index. Their reasons for excluding the volume of sales from the speculative group are, first, that the series is not in price terms, and second, that its movements are much more irregular than those of other series. *Ibid.*, July, 1923, Vol. V, p. 187.

son's investigation of the relation of interest rates to the volume of sales of stocks.⁷ His conclusion was that the call loan rate is not an important factor in causing an increase or decrease in the volume of trading.

⁷Thompson, *Relation of Call Money Rates to Stock Market Speculation*.

CHAPTER V

HIGH CALL LOAN RATES AND CYCLICAL VARIATIONS IN SPECULATION

HAVING tested the relation of low call loan rates to the recovery of stock speculation, we shall now examine the data to determine the relation of high call loan rates to the decline of speculation. The period covered is the same as in Chapter IV, 1872 to 1922.

During the prolonged period of high interest rates in 1872-1873 stock prices first advanced and then declined. The precise point at which stock prices began to advance during this period cannot be determined from available data, but they were advancing throughout the year 1872. In January, February, and March of that year call loan rates averaged above 14 per cent each month, yet stock prices advanced five points during that period. The period of highest prices was from April, 1872, to February, 1873. During this period there were only three months when call loan rates averaged less than 9 per cent; in three other months, the rate averaged above 35 per cent. The highest prices for stock were thus reached in months of very high call loan rates.

During most of the remaining months of high rates the stock index declined. The net change for the entire period was one point.

The period of high rates in 1877-78 was accompanied by an advance in stock prices. The low point of interest rates in 1877 was reached in June, when the average was 1.75 per cent. The low point of the average of stock prices was reached in July. Both interest rates and stock prices advanced during August and September. The period of high rates lasted from September, 1877, to May, 1878, a period of nine months. The average of stock prices advanced four points during this period. Rates were high again from August, 1879, to May, 1880. During this period stocks advanced in price almost continuously.

In the period of high call loan rates from November, 1880, to May, 1883, stock prices advanced for seven months, then began a prolonged decline. During the first six months of this period, while rates were as high as 11, 22 and even 50 per cent, stock prices advanced 10 points. In February, 1881, call rates averaged 50.12 per cent; yet stock prices advanced five points in that month above the January level. In June, 1881, prices turned downward and the decline continued through 23 months of high rates and 19 months of low rates. The stock market was apparently little influenced by the money market.

Rates were high from August, 1886, to January,

1888. During this period stocks advanced for eight months, then began a major decline.

The decline of stock prices which began January, 1890, was preceded by six months of high call loan rates. The rates had averaged above 9 per cent for two months and above 7 per cent for one other month preceding the decline of prices. In January when the decline began, the average rate was 7.70 per cent, and rates remained moderately high throughout the year. The decline in stock prices continued until December, 1890; high interest rates continued until January, 1891.

In the next period of high rates four months elapsed before stock prices began a major decline. Rates were high from September, 1892, to September, 1893. Stocks advanced till January, 1893, then declined 32 points in eight months.

In the next period of high rates, from December, 1895, to March, 1896, stock prices made a net change of only one point.

During four months of high rates in 1896, stock prices advanced 11 points. Rates had been low and prices had declined earlier in the year; in August rates became high and stock prices began a major recovery.

The fall of stock prices which began in November, 1899, was preceded by eight months of high call loan rates. Rates were high almost continuously from March, 1899, to January, 1900. Stock prices declined from November, 1899, to July, 1900.

Only two months of high call loan rates preceded the decline of stock prices which began in June, 1901. In June, when the peak in prices was reached, the interest rate averaged 4.31 per cent. Call rates were high in most of the months from April, 1901, to April, 1903. During this period the stock market tended downward with occasional rallies.

A long period of high rates began in September, 1905; stock prices began a major decline in January, 1906. Rates were high throughout the year 1906, except for June and July. A rally in stock prices occurred in August and September, but the decline was resumed later in the year and continued until after the panic of 1907. Interest rates remained high until March, 1907, and then were low for only three months, so that high rates and declining prices characterized the whole period.

Two months of high call rates preceded the decline in stock prices of 1910. Rates were high from October, 1909, to January, 1910. The rate for December, 1909, when the decline in stock prices began, averaged 5.03 per cent. The rate declined in January, 1910, to 4.72 per cent, and in February to 2.78 per cent. It stayed at moderate levels for the remainder of the year and for the first 11 months of 1911. Stock prices tended downward until October, 1911, but after the middle of 1910 the change was small.

In October, 1912, a major decline of stock prices started in the same month in which interest rates became high. Rates remained high for seven

months, while stock prices continued to decline for more than a year.

A period of high rates extended through the last five months of the year 1914. As the Stock Exchange was closed from August until December, it is impossible to determine accurately what changes in stock prices were taking place at this time. Unofficial quotations indicate that the low point of prices was touched at least as early as October.¹ This period of high rates was, therefore, probably accompanied by a considerable recovery of stock prices.

From September, 1917, to December, 1922, interest rates continued at high levels. It is unnecessary to discuss in detail the stock market history of this period. From the beginning of the period to December, 1917, stock prices declined 24 points. Then they advanced 21 points by October, 1918; declined six points in the following three months; soared 43 points to a record high level in October, 1919; slumped 63 points by August, 1921; and had recovered 43 points by the end of the period included in our survey.

We may now summarize the data on the relation of call loan rates to the decline of stock prices. Of the 17 periods of high rates from 1872 to 1922, 10 were marked by the beginnings of considerable declines in industrial stock prices. The essential

¹See the index of Industrial Stocks, computed by Edwin Frickey, published in the *Review of Economic Statistics*, August 25, 1921, Vol. III, p. 276.

facts regarding these cases are shown in the following table:

PERIODS OF HIGH RATES ON CALL LOANS DURING WHICH MAJOR DECLINES IN INDUSTRIAL STOCK PRICES BEGAN.

Date when High Rates Began	Date when Decline Began	Interval (months)
September, 1871 *	February, 1873	17
November, 1880	June, 1881	7
August, 1886	May, 1887	9
July, 1889	January, 1890	6
September, 1892	January, 1893	4
March, 1899	November, 1899	8
April, 1901	June, 1901	2
September, 1905	January, 1906	4
October, 1909	December, 1909	2
October, 1912	October, 1912	0

* Except for three months in the summer of 1871, rates had been high for many years.

The major declines of stock prices which began in periods of high rates are often cited as supporting the accepted theory. It will be noted, however, that there has been great variation in the length of the period of high rates before stock prices turned downward. If the first month of high rates in 1912 caused the decline of stock prices in that year it seems strange that stocks continued to advance for such long periods in other years when interest rates were high.

Three periods of high rates were accompanied by irregular movements of stock prices. The facts regarding these periods are presented in tabular form below:

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PERIODS OF HIGH RATES ON CALL LOANS ACCOMPANIED BY IRREGULAR MOVEMENTS IN STOCK PRICES.

Period of High Rates	Length of Period (months)	Change in Stock Prices
Nov., 1875-April, 1876	6	Early advance followed by decline. No net change.
Sept., 1877-May, 1878	9	Irregular market. Net change one point.
Dec., 1895-March, 1896	4	Decline followed by advance. Net loss of one point.

Two periods of high rates were marked throughout by advancing stock prices. These periods were as follows:

PERIODS OF HIGH RATES ON CALL LOANS ACCOMPANIED BY ADVANCING STOCK PRICES.

Period of High Rates	Length of Period (months)	Net Advance in Stock Prices (points)
Aug., 1879-May, 1880	10	8
Aug., 1896-Nov., 1896	4	11

During one period of high rates the Stock Exchange was closed so that no definite statement regarding the behavior of the market can be made. Finally, one period of high rates (1917-22) continued through two major advances and two major declines of the stock market.

The price movements are so completely lacking in uniformity, that they give no support to the accepted theory. When the theory was presented in Chapter

I, it was pointed out that the time required for low interest rates to affect stock prices is usually not stated. One case can be found to support the theory that the first month of high rates brings about declining stock prices; namely, the decline beginning in October, 1912. If the theory is taken to mean that stock prices decline after two months of high rates, two cases may be found to support it. Two other cases confirm a hypothesis that a four months period of low rates precedes the decline. One case indicates that the period is six months; one that it is nine months; one that it is 17 months; and in one case rates remained high through two complete stock market cycles.

In short, the action of the stock market in periods of high call loan rates has displayed no uniformity. Some periods of high rates were marked by continuous advances in stock prices, others were accompanied by only minor fluctuations, others included several months of advancing stock prices with declines later. Still others were marked by declines followed by major advances.

CHAPTER VI

SHORT TIME LOAN RATES AND SPECULATION

IN the preceding chapters the relation of call loan rates to cyclical variations in speculation has been examined, and the theory that changes in the call loan rate are the cause of variations in stock prices has been found to be without support. Some economists, however, have contended that the changes in stock prices which characterized the successive phases of the business cycles are to be explained by variations in the rates on short time loans rather than by variations in the rates on call loans.¹ It is necessary, therefore, to examine the periods of high and low short time interest rates in comparison with the accompanying movements of stock prices.

The rates used in this portion of our study are quotations for prime non-collateral paper in New York with a maturity of from 60 to 90 days. The data used are the average monthly rates computed by W. L. Crum for the Harvard Committee on Economic Research. These averages are reprinted in Appendix F. They are shown graphically in the chart opposite p. 53.

¹See p. 13.

The median monthly rate for the period from 1872 to 1922 has been chosen as the standard for determining what should be considered a low or a high rate. This median is 5.03 per cent. Anything below that figure is considered a low rate and anything above it is considered high.

The reasons for the choice of the median as the form of average to be used were discussed in Chapter IV in connection with call loan rates.² A single average is satisfactory for such a time series as the rate of interest, provided there is no long time tendency either upward or downward. The trend of short time interest rates for the period from 1872 to 1922 is so nearly horizontal that a single average can be used for the entire period.

The stock market movements are the same ones we have discussed in Chapters IV and V, and the major swings of the short time rates are similar to those of call loan rates. Hence, it seems unnecessary to review the relationships of the short time rates and the stock prices in as much detail as we have given in regard to call loan rates and stock prices. The results of our comparisons will be shown chiefly by means of summaries and tabular statements.

²For purposes of comparison, arithmetic means of the rates were computed. For the period from 1874 to 1903, the arithmetic means of the rates was found to be 4.93 per cent. From 1904 to 1922, the mean was 4.96 per cent. If the very high rates of 1872 to 1873 be included, the arithmetic mean of the rates for 51 years, 1872 to 1922, is 5.12 per cent.

I. LOW SHORT TIME RATES AND STOCK PRICES.

Four periods of low short time rates were accompanied by the beginnings of recoveries of stock prices. These periods are shown in the table which follows:

PERIODS OF LOW SHORT TIME RATES ACCOMPANIED BY BEGINNINGS OF ADVANCES IN STOCK PRICES.

Period of Low Rates	Month when Recovery Began	Length of Period of Low Rates before Recovery (months)
Feb., 1877-July, 1877	July, 1877	5
Dec. 1884-July, 1886	Jan., 1885	1
Dec. 1896-Sept., 1899	Apr., 1897	4
Dec., 1910-July, 1912	Oct., 1911	10

Six periods of low rates on short time loans were marked by the continuation of advances in stock prices which had begun in preceding periods. These are as follows:

PERIODS OF LOW SHORT TIME RATES MARKED BY CONTINUED ADVANCE IN STOCK PRICES.

Period of Low Rates	Length of Period (months)	Advance in Stock Prices (points)
May, 1888-Aug., 1888	4	4
Nov., 1888-July, 1889	9	4
Dec., 1891-Sept., 1892	10	12
Jan., 1904-Oct., 1905	22	35
Apr., 1908-Sept., 1909	18	32
Jan., 1922-Sept., 1922	9	26

Four periods of low rates on short time loans were marked by the continuation throughout of declines in stock prices. These are listed below:

PERIODS OF LOW SHORT TIME RATES MARKED BY CONTINUED
DECLINE IN STOCK PRICES.

Period of Low Rates	Length of Period (months)	Decline in Stock Prices (points)
May, 1875-Aug., 1875	4	4
June, 1876-Sept., 1876	4	5
Jan., 1884-Apr., 1884	4	3
Jan., 1910-June, 1910	6	14

Six periods of low rates were accompanied by irregular movements of stock prices. The duration and the market behavior of these periods are shown in the following table:

PERIODS OF LOW SHORT TIME RATES MARKED BY IRREGULAR
MOVEMENT OF STOCK PRICES.

Periods of Low Rates	Length of Period (months)	Behavior of Stock Market
May, 1878-Sept., 1878	5	Fluctuation within a range of 1 point.
May, 1881-Aug., 1881	4	Advance and decline, net gain 1 point.
Nov., 1893-Dec., 1895	26	Advance 9 points; decline 7 points; advance 12 points; decline 13 points.
Jan., 1900-Aug., 1902	32	Decline 11 points; advance 21 points; decline 11 points.
Jan., 1914-July, 1914	7	Advance followed by decline; no net change.
Dec., 1914-Aug., 1917	33	Advance 71 points; decline 26 points.

Comparison of the dates of periods of low interest rates and of recoveries in stock prices indicates that the recoveries are not caused by the low rates. Definite tests of the truth of the accepted theory are difficult because most statements of the doctrine are indefinite. The length of time required for low rates to cause an advance in stock prices is not stated. Neither is a definite statement made as to what rate on short time loans is low enough to stimulate speculation. The histories of interest rates and stock prices, however, do not support *any* theory that the movements of prices are controlled by changes in the rate of interest on short time loans.

To summarize the evidence thus far presented: during periods of low interest rates in 1875, 1876, 1884, 1896, and the first part of 1910, stock prices declined. During the periods of low rates in 1888, 1892, 1904-5, 1908-9 and 1922, they advanced. Both 1894 and 1895 were years of low interest rates; stock prices advanced and declined in 1894, and again advanced and declined in 1895. While rates were low in 1900 and 1901, stocks declined for nine months, made a major recovery, and began a major decline. In 1910-11, while interest rates were low, stocks first advanced, then made a precipitate decline, and finally began a major recovery. During the period of low rates in 1915-17 stocks first advanced and then began a great decline. In 1922 stocks advanced, but the advance had already begun before rates became low.

To summarize the story in another way: since 1872, the stock market has made 15 major advances. Seven of these began when interest rates were low, and eight began when they were high. The rate when the recovery began varied from 3.53 per cent in April, 1897, to 7.50 per cent in November, 1907. In 1895, the recovery followed 15 months of very low rates. In 1907, it anticipated the beginning of low rates by five months. Likewise, in 1891 and in 1903 the advance of prices anticipated the low interest rates.

In 1918, and again in 1919, the stock market recovered without any period of low rates either immediately preceding or immediately following. Interest rates were higher during the bull movement of 1918 than they had been during the bear movement of 1917. In 1919, a bull movement began and ended during a period of high rates. The movements of interest rates coincident with the different recoveries of stock prices are so unlike that the data lend no support to any theory which attempts to explain the recovery by low interest rates.

II. HIGH SHORT TIME RATES AND STOCK PRICES.

We now turn to a brief comparison of periods of high rates on short time loans and the movement of industrial stock prices. Here we find irregularities and contradictions so similar to those found in our other comparisons that it is unnecessary to discuss the evidence in great detail.

Nine declines of stock prices began in periods of high rates on short time loans. The facts regarding these declines are shown in the accompanying table. It will be noted that the length of the period of high rates has varied from one month preceding the declines of 1899, of 1909, and of 1912, to 18 months preceding the decline of 1873, and 25 months preceding that of 1919.

MAJOR DECLINES OF STOCK PRICES BEGINNING IN PERIODS OF HIGH RATES ON SHORT TIME LOANS.

Month when Decline Began	Length of Preceding Period of High Rates (months)	Rate for the Month when Decline Began (per cent)
Feb., 1873	18	9.15
May, 1887	9	5.20
Jan., 1890	5	5.15
Jan., 1893	3	5.09
Nov., 1899	1	5.44
Jan., 1906	2	5.05
Dec., 1909	1	5.09
Oct., 1912	1	5.92
Oct., 1919	25	5.38

In nine cases major recoveries of stock prices began while short time interest rates were high. The facts regarding these recoveries are shown in the table on page 79.

The stock market has not uniformly or even usually declined in periods of high interest rates. In many years high rates were accompanied by advancing stock prices and in other years they were accompanied by only minor fluctuations. Even in those

MAJOR RECOVERIES OF STOCK PRICES BEGINNING IN PERIODS OF HIGH RATES ON SHORT TIME LOANS.

Month when Recovery Began	Length of Preceding Period of High Rates (months)	Rate for Month when Recovery Began (per cent)
Nov., 1873	Over 34	13.85
Apr., 1888	20	5.41
Dec., 1890	4	7.30
Aug., 1896	7	7.81
Nov., 1903	14	5.97
Nov., 1907	24	7.50
Oct., 1914	2	6.44
Dec., 1917	3	5.50
Aug., 1921	47	5.95

years when high interest rates preceded a decline, stock rates often advanced in the face of the high rates several months before the downward movement began.

Clearly, if the movement of short time interest rates causes changes in stock prices, the effect should not be a major recovery in one year and a major decline in another. We conclude that low interest rates are not the cause of recoveries in stock prices, nor high interest rates the cause of declines in stock prices.

CHAPTER VII

CHANGING RATES ON SHORT TIME LOANS AND VARIATIONS IN SPECULATION

IN previous chapters we have discussed the relation of low interest rates to the recovery of stock prices, and of high interest rates to the decline of stock prices. Attention has been centered on the periods of low and high rates as related to changes in the movement of prices. One further refinement of the accepted theory remains to be considered. The recovery of stock prices in times of depression is sometimes explained by the number of months during which interest rates have been *declining*, rather than by the number of months of *low* rates preceding the recovery. The decline of stock prices in times of prosperity, likewise, is sometimes explained by the number of months during which interest rates have been *advancing*, rather than by the number of months of *high* rates preceding the decline

To indicate what this theory is, a statement of it will be introduced at this point. The following quotation is taken from the publications of the Harvard Committee on Economic Research.¹

¹ *Review of Economic Statistics*, 1919, Vol. I, August supplement, p. 12. See also *The Harvard Index of General Business Conditions*, 1923, pp. 4-8.

"It would appear from these charts² that the effect of declining rates on a low price stock market or of increasing rates on a high price stock market must be continued for a year or more before the influence of changing bank rates is fully felt by stock prices. In other words, speculation tends to proceed unchecked for a number of months after the rate on commercial paper has reached a comparatively high figure."

It will be noted that in this variant of the accepted theory significance is attributed to the time when interest rates turn upward or downward rather than to the time when they become comparatively high or low. In the present chapter we shall examine the evidence which bears on this doctrine.

In this discussion we have used a method slightly different from that used in Chapters IV and V, in that account has been taken of the seasonal movement of interest rates and the secular trend of stock prices.³ The data for stock prices are the same averages which were used in previous chapters, but trend has been eliminated by fitting a straight line to the data for 1874-97 and another to the data for 1898-1922, and reducing the items to deviations from these trends. The interest rates are also the same as were used in previous chapters. They have been adjusted for seasonal variation by the application of the correction factors worked out by W. L. Crum.⁴ For the post-war period the correction applied is one-half that worked out by Mr. Crum for the period

²The charts referred to give data for the years 1903-14.

³For discussion of reasons, see Appendix I.

⁴*Review of Economic Statistics*, January, 1923, Vol. V, pp. 17-29.

1890-1916. These correction factors were worked out by the link-relative method, devised by Warren M. Persons and generally used in the publications of the Harvard Committee on Economic Research.⁵ The adjusted data are shown in Appendix K.

The comparison called for in examining the interval between an up-turn of interest rates and a succeeding down-turn of stock prices is very difficult to make with precision, because the stock prices, and still more, the interest rates, are subject to irregular fluctuations which give room for difference of opinion concerning the location of the most significant turning points. In the following analysis an attempt has been made to select for attention those turning points which most fairly test the theory; but there are a number of cases in which opinions may well differ. It may be added that the difficulty which the student experiences in locating the significant turning points in the course of interest rates in the past, reflects the still greater difficulty which a speculator would have had in recognizing them at the time they occurred.

⁵ We have applied the correction factors directly to the original items instead of applying them to a line of secular trend as is the practice of the Harvard Committee. For the period under review the trend of interest rates is so nearly horizontal that it has seemed unnecessary to make correction for it.

While we do not at this time accept unreservedly the link-relative method as the most satisfactory device for the elimination of seasonal variation, we have preferred in this case, in order that attention may not be diverted from the main point at issue, to employ approximately the same seasonal correction as has been employed by adherents of the doctrine under review.

I. DECLINING SHORT TIME INTEREST RATES AND STOCK PRICES.

The table below gives the information necessary for a test of the point at issue. This table shows the date of the beginning and the end of each period of declining interest rates of more than seven months duration, the dates when stock prices began to recover following each of these down-turns in interest rates, and the number of months of declining interest rates preceding each such recovery.

DECLINING INTEREST RATES AND ADVANCING STOCK PRICES.

(Computed from data corrected for seasonal influence in interest rates and secular trend in stock prices.)

Period of Declining Interest Rates				Length of Period (months)	Beginning of Advance in Stock Prices	Interval (months)
Oct., 1873	Aug., 1876			34	Nov., 1873	1
Oct., 1877	Aug., 1878			10	Jan., 1879 ^a	15
March, 1883	Sept., 1885 ^b			30	Jan., 1885	22
July, 1887	May, 1889			22	Apr., 1888	9
Nov., 1890	June, 1892			19	Dec., 1890	1
July, 1893	Oct., 1894			15	Aug., 1893	1
Apr., 1898	Dec., 1898			8	.....^c	..
Aug., 1903	July, 1904			11	Nov., 1903	3
Dec., 1907	Aug., 1908			8	.....^c	..
July, 1910	Nov., 1911			16	Oct., 1911	15
June, 1913	Nov., 1915 ^c			29	Oct., 1914 ^d	16
June, 1918	Oct., 1919			16	.....^e	..
June, 1920	Aug., 1922			26	Aug., 1921	14

^a No material advance in stock prices until after the close of the period of declining interest rates.

^b Interrupted by advancing rates from March to July, 1884.

^c Interrupted by a sharp temporary advance in August, 1914.

^d See p. 68.

^e An advance in stock prices which had already begun, continued throughout the period.

The periods of declining rates preceding recoveries of stock prices have varied greatly in length. From 1872 to 1922 there were 13 periods in which the interest rate displayed a downward trend for periods ranging from 8 months to over two years. In three of these cases the stock market was already moving upward when the down-turn in interest rates occurred and continued its upward trend throughout the period. In another case there was no considerable up-turn in stock prices until the interest rate had completed its downward swing and had been moving upward for five months. In the other nine cases stock prices turned upward during the period of declining interest rates, but the interval before the advance of stock prices varied widely. In three cases it was one month; in four others it was as much as 15 months. There is no tendency for the items to group themselves about a typical value.

Moreover, there occurred during this period five major recoveries of stock prices which are not taken account of in the tabulation because they began while interest rates were advancing or during down-swings of very short duration.

The first such recovery was that of 1895. In October, 1894, the adjusted interest rate was 2.46 per cent, this being the lowest figure which had been reached in many years. From this point the rate advanced steadily to 4.21 per cent in April of 1895, and then fluctuated irregularly for the remainder of the year. It has never since reached the low level of

October, 1894. In February, 1895, stock prices began a major up-turn which culminated in June of that year.

Secondly, in June, 1896, the adjusted interest rate was 4.76 per cent. During the next four months the rate advanced to an average of 7.66 per cent, this being the highest figure recorded between 1873 and 1920. It then collapsed to 4.92 in November and 3.38 in December, after which the changes were insignificant for more than a year. In August stock prices began a major advance. This advance culminated in November, but in the following April the market once more turned definitely upward.

Thirdly, in September, 1900, the market began a major advance. Rates had reached a peak in the preceding December and had declined until May, but had recovered slightly during the summer.

Fourthly, in 1907 stock prices began to advance before short time interest rates reached their peak. The rates had been advancing ever since the beginning of the year 1905 and reached a level of 7.27 per cent in December. Stock prices, however, reached their low point in November.

Fifthly, the great bull movement in stocks which began in December, 1917, was not preceded by declining interest rates. The low point of rates had been reached in 1915. Rates advanced during most of the months of 1916 and 1917 and continued to advance through the bull movement in stocks of 1918.

II. ADVANCING SHORT TIME INTEREST RATES AND STOCK PRICES.

We must next test the other phase of the theory, namely, the doctrine that advancing short time interest rates are the cause of major down-turns of stock prices. The periods of advancing rates lasting eight months or more, and the succeeding declines of stock prices, from 1872 to 1922, are shown in the accompanying table.

ADVANCING INTEREST RATES AND DECLINING STOCK PRICES.

(Computed from data corrected for seasonal influence in interest rates and secular trend in stock prices.)

Period of Advancing Interest Rates	Length of Period (months)	Beginning of Decline in Stock Prices	Interval (months)
Aug., 1876 Oct., 1877 ^a	14	.....^b	..
Aug., 1878 May, 1880 ^c	21	.....^a	..
Oct., 1880 March, 1883 ^c	29	June, 1881	8
Sept., 1885 July, 1887	22	May, 1887	20
May, 1889 Nov., 1890	18	Jan., 1890	8
June, 1892 July, 1893	13	Jan., 1893	7
Oct., 1894 Oct., 1896	24	June, 1895	8
Dec., 1898 Dec., 1899	12	Apr., 1899	4
May, 1900 Aug., 1903	39	June, 1901	13
July, 1904 Dec., 1907	41	Jan., 1906	18
July, 1909 July, 1910	12	Aug., 1909	1
Nov., 1911 June, 1913	19	Sept., 1912	10
Nov., 1915 June, 1918	31	Nov., 1916	12
Oct., 1919 June, 1920	8	Oct., 1919	0

^a Interrupted by declining rates from January to March, 1877.

^b A decline already under way continued to July, 1877.

^c Interrupted frequently by temporary declines.

^d No considerable decline in stock prices until June, 1881.

The periods of advancing interest rates preceding declines of stock prices have varied greatly in

length. As the table shows, there were, between 1872 and 1922, 14 periods of eight months or more during which the trend of short time interest rates was upward. In one of these cases a stock market decline which was already under way continued until nearly the end of the period. In another case there was no considerable advance in stock prices until after the interest rate had completed its upward swing of 21 months, turned downward for five months and again moved upward for eight months. In the other 11 cases stock prices began to decline during the period of advancing interest rates, but the intervals display almost as little regularity as we have found in our examination of declining interest rates and advancing stock prices. In one case the advance in interest rates and the decline in stock prices began in the same month. In one case the interval was one month, in two cases it was as much as 18 months, and in the other cases there is no approach to uniformity.

In summary, we find no substantiation of the doctrine under review. Of 15 major recoveries of stock prices since 1872, five began when rates were advancing, and four others were preceded by less than four months of declining rates. Of 13 major declines of stock prices, four were preceded by four months or less of declining interest rates, and two were preceded by as much as 18 months of declining rates. The most that can be said in confirmation of the theory is that major advances in stock prices are

considerably more likely to begin in declining money markets than in advancing money markets. No typical figure can be given for the usual length of either the period of advancing interest rates or the period of declining rates preceding a change in the movement of stock prices. There is no usual length of such periods.

CHAPTER VIII

THE CORRELATION BETWEEN INTEREST RATES AND STOCK PRICES

ANOTHER method by which the time relationship of two series may be tested is through the use of the Pearsonian coefficient of correlation.¹ In using this method the coefficient of correlation of the two series is first computed, pairing items of the same date; then one series is slipped ahead for a definite interval and the correlation is computed again. This process is repeated for different intervals until it becomes clear how much the one series must be moved ahead or behind to obtain the maximum degree of

¹“When two quantities are so related that the fluctuations in one are in sympathy with the fluctuations of the other, so that an increase or decrease of one is found in connection with an increase or decrease (or inversely) of the other, and the greater the magnitude of the changes in the one, the greater the magnitude of the changes in the other, the quantities are said to be *correlated*.” Bowley, A. L., *Elements of Statistics*, Second Edition, 1902. p. 316.

The Pearsonian coefficient is a numerical measure of the closeness of correspondence. If a change in one variable is always accompanied by a corresponding proportional change in the other, the correlation is said to be positive and perfect, and is expressed by the coefficient $+1$. If a change in one is invariably accompanied by a proportional change in the other in the opposite direction, we have perfect negative correlation, expressed by the coefficient -1 . If changes in one are unrelated to changes in the other, the coefficient is zero. Partial correspondence is expressed by positive or negative coefficients between $+1$ and -1 .

correlation. The interval thus determined is interpreted as being the typical lag of changes in the one series behind changes in the other. The significance to be attached to the lag thus identified depends, first, on the magnitude of the maximum correlation, secondly, on the difference between the maximum correlation and that found for other intervals; and thirdly, on the regularity of the increase of the correlation figures as the maximum is approached.

This method was introduced into the study of economic cycles by English statistical economists, and has recently been used extensively in this country. As compared with the methods we have employed in previous chapters, the correlation method has the advantage of taking into consideration the interrelation of all the points on both curves instead of concentrating attention on the exact point where the upward or downward movement begins.

In applying this method to our present problem we have computed the coefficient of correlation between the quoted rates on 60-90 day paper and the prices of industrial stocks. The data are those which we have used in previous chapters. Secular trend has been eliminated from each series by fitting a straight line to the data for the period from 1874 to 1897, and another to the data for 1898-1922, and reducing the items to percentages of the corresponding trend items.² Quarterly averages of the data, with trend eliminated, are shown on the chart on

²For details of method see Appendix J.

p. 186. No correction has been made for seasonal variation as previous experiments have shown that the season-to-season variations of the two series are unrelated.³

In the first calculation, interest rates were correlated with stock prices for identical dates. Next, calculations were made to determine the correlation of interest rates with the stock prices quoted, 3, 6, 9, 12, 15 and 18 months later. Finally, similar calculations were made to test the degree of correspondence between interest rates and the stock prices of 3, 6, 9, 12, 15, and 18 months earlier. The results are shown in the chart on p. 92 and in the accompanying table.

CORRELATION BETWEEN INTEREST RATES AND STOCK PRICES WITH VARIOUS LAGS, 1874-97 AND 1898-1922.

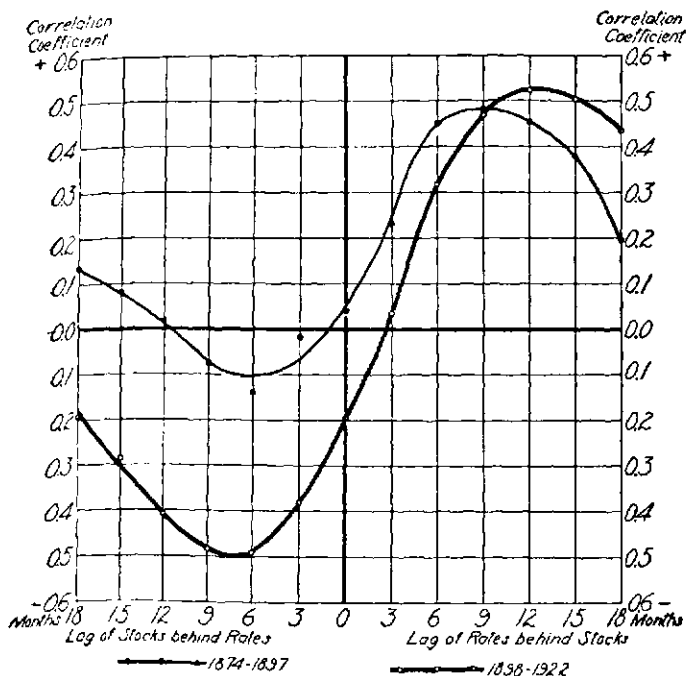
Series Lagged	Interval (months)	Coefficient of Correlation	
		1874-97	1898-1922
Stock Prices ^a	18	+ .132	- .193
"	15	+ .081	- .286
"	12	+ .019	- .408
"	9	- .073	- .482
"	6	- .138	- .490
"	3	- .018	- .380
Concurrent	0	+ .041	- .194
Interest Rates ^b	3	+ .283	+ .038
"	6	+ .452	+ .318
"	9	+ .482	+ .471
"	12	+ .456	+ .522
"	15	+ .379	+ .503
"	18	+ .195	+ .436

^a Interest rates correlated with stock prices of later date.

^b Interest rates correlated with stock prices of earlier date.

³ See Chapter II and Appendix I.

The relationship between stock prices and interest rates is not a random one. Let us examine first the results for 1898-1922. When interest rates are com-



CORRELATION BETWEEN RATES ON 60-90 DAY PAPER AND INDUSTRIAL STOCK PRICES FOR VARIOUS LAGS.

pared with stock prices of the same date the correlation is so low as to be of itself of no direct significance. When the data are "lagged" however, so that rates are compared with stock prices for a date either

3 to 12 months later or 9 to 18 months earlier, the correlation is too high to be accidental. Falling interest rates are followed by rising stock prices and rising stock prices in turn are followed by rising interest rates, and so through successive phases of a cycle with a fair degree of regularity.

The data for 1898-1922 afford no more conclusive evidence that advances in interest rates cause declines in stock prices than they do that advances in stock prices cause advances in interest rates. With stock prices lagged behind interest rates the correlation is negative and reaches a maximum at six to nine months. This means that typically upswings in interest rates are followed in from six to nine months by downswings in stock prices, and vice versa. The correlation coefficients of $-.490$ and $-.482$ indicate a considerable degree of regularity in the time relationship. This correlation taken by itself supports the theory which we have been criticizing throughout the book, and has been relied upon to some extent by adherents of the theory as corroboratory evidence. But we must not neglect the other half of the picture. When the direction of the lag is reversed we get still higher correlations, this time positive instead of negative. Interest rates compared with stock prices of 12 months earlier show a correlation of $+.522$, and with those of 15 months earlier $+.503$. This means that typically interest rates turn upward and downward a year or so after similar changes in stock prices.

If we do not interpret changes in either of these series as the direct cause of changes in the other, but assume instead that both are influenced by some outside cause, the correlations are again equally susceptible of either of two explanations. If the same outside cause brings about declines in interest rates and advances in stock prices, its effects become evident sooner in the money market than they do in the stock market. If, on the other hand, some outside cause tends to bring about advances both in stock prices and in interest rates, it becomes effective sooner in the stock market than in the money market, since stock prices usually move upward first. The data are thus equally consistent with either explanation.

The inconclusiveness of these results is not accidental. It is the situation we always find when two series have correlated wave movements and the waves do not vary greatly in length. In such cases, a positive correlation found by lagging the data in one direction necessarily implies a negative correlation to be found by lagging the data in the other direction.⁴ If, for example, one series shows a ten-

⁴It can readily be demonstrated that when two series have major fluctuations of uniform duration, the series of coefficients obtained by successive correlations of the items, paired with equal increments of lag, will themselves trace a cycle with a uniform period equal to that of the original series. In that case if one of the series is found to be a quarter of a period "ahead" of the second, it is equally true that the second is three-quarters of a period "ahead" of the first. The sequence of fluctuation is inherently ambiguous. But where the successive fluctuations are not of equal duration, the circumstances are entirely different.

dency to advance and decline six months after a similar movement in another series, and if the cycles of both items are exactly 30 months in length, then the first will begin to decline nine months after an upward movement begins in the second. If there is a perfect positive correlation with a lag of six months in one direction, there will be a perfect negative correlation with a lag of nine months in the other direction, and the correlation test will throw no light on the question which variable controls the other. If the correlation with the data lagged in one direction portrays the operation of a true causal relationship, the inverse correlation with the data lagged in the other direction gives a spurious indication of an inverse causal relationship.

This is substantially the situation in the period under review (1898-1922). The cycles display a moderately uniform length of about 40 months. Stock prices turn upward; about 12 to 15 months later interest rates follow. Six to nine months later stock prices turn downward; then a year later interest rates turn downward. Finally, after six to nine months, stock prices start upward again, and the cycle is complete. The data do not tell us which variable really follows the other.

In series whose wave movements are of irregular lengths we do not meet the difficulty to which we have made reference. If, in our illustrative case,

In this case, a series of correlation coefficients computed for various lags do determine the sequence unambiguously.

the waves are irregular in length, and the first series advances and declines invariably six months later than the second, the interval from an advance of the second to a decline of the first will be irregular. Perfect positive correlation may appear when the first series is lagged six months, but if so there is no possible lag in the opposite direction which will give perfect negative correlation. The greater the irregularity in the lengths of the cycles, the less will be the correspondence between the degree of positive correlation to be obtained by shifting the series in the one direction and the degree of negative correlation which will appear when they are shifted the other way.

This is the sort of situation we find when we turn to the earlier period (1874-97). The waves vary more in length, and the correlations which we find when one item is lagged do not reappear in inverse form when the other item is lagged. The correlations without any lag and with stock prices lagging for periods of from 3 to 18 months are all too small to have any independent significance. It is impossible to shift the data in such a way as to bring out a consistent lag in the movements of stock prices behind the inverse movements of interest rates, such as we found in the period from 1898 to 1922. So far as the data indicate, during the period from 1874 to 1897 stock prices were quite as likely to move in the same direction that interest rates had moved from 3 to 18 months earlier as

they were to move in the opposite direction, as the theory would lead us to expect.

On the other hand, the positive correlation between stock prices and interest rates for some months later, although not quite as high as in the period from 1898 to 1922, is high enough to be significant.

This fact goes a long way toward answering the question which our results for the later period failed to answer. The correlations as found in both periods are large enough to suggest the existence of some force tending to maintain a regular time sequence between the fluctuations of one of the variables and those of the other. The data for the later period do not tell us which lag, that of interest rates behind stock prices or that of stock prices behind interest rates, points to a true causal relationship. When we turn to a period, such as that from 1874 to 1897, when the cycles are less uniform in length, we must find one or the other of these correlations disappearing. We cannot have a high degree of regularity in the interval from the crest of the stock market curve to the corresponding crest of the interest rate curve and also great regularity in the interval from the crest of the interest rate curve to the trough of the stock market curve, unless we have great regularity in the length of the complete cycle. Since one of the lags maintains its regularity through this period of irregular cycles, and the other does not, a strong probability emerges that the

persistent lag is of the greater significance, for the later period as well as for the earlier.⁵

In summary, the data for both periods show clearly that there is a pronounced tendency for interest rates to lag behind stock prices in their upward and downward movements, with an interval of about 12 months. During recent years there has also been a tendency for stock prices to begin their recoveries about eight or nine months after interest rates start downward, and to turn downward about eight or nine months after interest rates begin to recover. But this tendency cannot be discerned before the year 1898. The regularity of lag of stock price movements behind inverse fluctuations of interest rates in the more recent period is, on the face of it, explicable either as the evidence of some causal relationship between high interest rates as the antecedent and low stock prices as consequent, or, equally well, it may be explained as the result

⁵The numerical value of the maximum correlation coefficient is somewhat over one-half, which signifies that the similarity of movement in the two series is of moderate extent. However, this degree of similarity of fluctuation is established with a certainty not to be measured by the ordinary concepts of probability as applied to correlation or the conventional "probable error." The usual concept of the degree of reliability or significance of a correlation coefficient as being proportional to its numerical value has no application in this case. The fact that the coefficients computed for the various lags lie on a fairly smooth curve serves to establish this limited degree of similarity with practical certainty. The proof of this is contained implicitly in a paper by Rietz, H. L., "Functional Relations [that is, perfect correlations] for which the Coefficient of Correlation is Zero," *Quarterly Publications of the American Statistical Association*, September, 1919, Vol. XVI, p. 472.

of the operation of a tendency of interest rates to lag behind stock prices during an accidental succession of cycles of fairly equal length. The latter explanation is in harmony with the evidence obtained from the earlier period, the former explanation is not.

CHAPTER IX

SPECULATIVE AND NON SPECULATIVE SECURITIES: THEIR RELATIVE SENSITIVENESS TO CHANGES IN THE MONEY MARKET

OUR final statistical test of the doctrine under review consists of a slightly different analysis of the period from the close of the World War through 1924. For purposes of this investigation we have classified our stock price data in accordance with the speculative or non-speculative character of the securities. The indexes which we have employed in our discussion of the pre-war period did not enable us to distinguish between transactions which were purely speculative and those which were in considerable part of an investment character. While the stocks which make up these indexes had active speculative markets, most of them were dividend payers. Many semi-permanent investors prefer this kind of securities to bonds or high grade preferred stocks on account of their marketability and relatively high yield so that the trade in them does not reflect purely speculative sentiment. None of the indexes currently published is based on a classification of stocks according to their speculative or non-speculative

character; hence we have prepared special indexes of this kind for our purpose.

I. THE INDEXES OF STOCK PRICES.

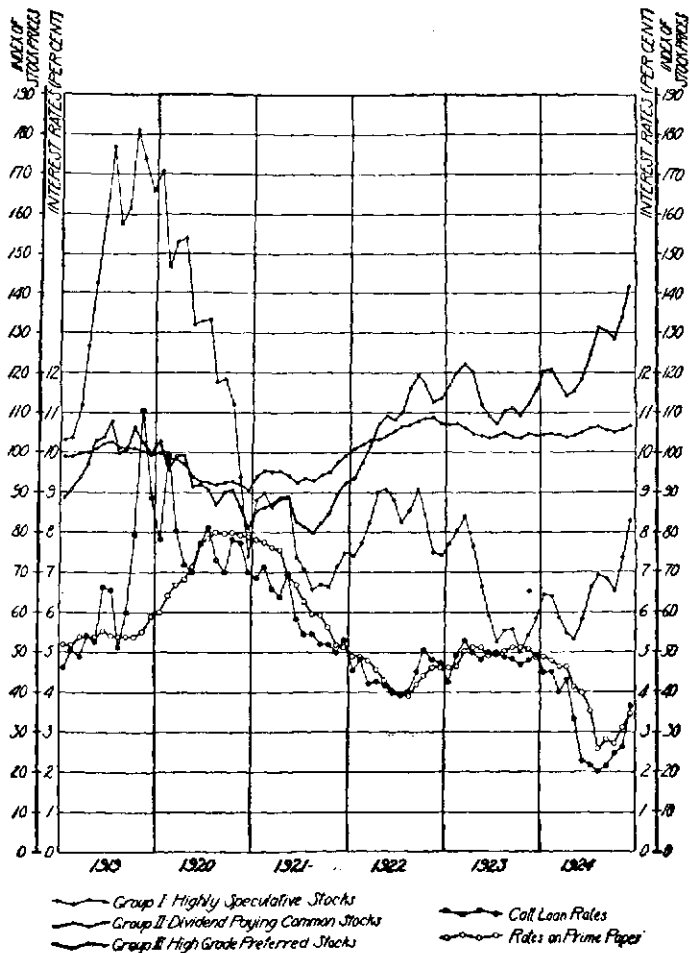
Three separate indexes have been made, all covering the period from January, 1919, to December, 1924. Ten stocks were used for each index. The lists of stocks used in computing the averages, together with the monthly figures, may be found in Appendix G. The indexes are shown graphically in the chart on p. 102.

In the highly speculative group, Group I, it was planned to include only non-dividend paying stocks. It was found necessary, however, to include the stocks of three companies which had paid some dividends during the period from 1919 to 1924. Two of these companies paid only one small dividend, and the third paid a dividend of 75 cents per quarter for five quarters. These dividends are not considered sufficient to take the stocks out of the highly speculative group.

The second group is made up of common stocks which have paid dividends without interruption and at a fairly steady rate throughout the years from 1919 to 1924. Most of these stocks had been paying dividends for several years before 1919, so that their reputation as dividend payers was fairly well established by January, 1919.

The third group is composed entirely of preferred stocks of high grade. The same dividend rate has

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INTEREST RATES AND STOCK PRICES 1919-1924.

been maintained on each of these stocks since January, 1919, and for several years prior to that time.

The extent of the fluctuations in price varies with the speculative or non-speculative nature of the stocks. The fluctuations of the highly speculative stocks are very wide, those of the dividend paying common stocks moderately wide, and those of the high grade preferred comparatively narrow. The highly speculative stocks advanced to very high levels in 1919, but later suffered a much greater decline than did either of the other groups. The non-speculative preferred group suffered the smallest loss during the decline of 1919 and 1920. The dividend paying common stocks fluctuated more than did the preferred. They advanced to higher levels than the preferred on each major upward swing, and went below the preferred on the subsequent declines.

The agreement of the highly speculative stocks and the dividend paying common stocks in the direction of their price movements is particularly striking. Throughout 1919 the speculative stocks were much higher in price than were the dividend paying common stocks, as compared with their respective averages for the five years, but for each advance or decline of the one, there was a corresponding movement of the other. The dividend paying group touched its high point earlier than did the group of highly speculative stocks, but this was only because the rally of the speculative stocks in October

was a little smaller than the rally of the dividend payers which occurred at the same time. On the decline in 1920, the highly speculative stocks lost more ground than did the stocks of Group II, but the temporary rallies of the two groups occurred in the same months. The same similarity of the fluctuations of the highly speculative stocks and the dividend payers may be observed in other years. The two groups touched their low points in 1921 in the same month. They touched the high points in the advance of 1922-3 and the low points in the subsequent decline at different times, not because of a difference in the direction of their concurrent fluctuations, but because of a difference in the extent of their respective advances or declines. In 1924 the dividend payers turned upward one month earlier than did the highly speculative group.

The high grade preferred stocks have usually moved ahead of the other groups. In 1919, Group III, the high grade preferred stocks, touched its high point in July. Group II touched its high at the same time, but made another high in October when the stocks of Group III had no rally. Group I touched its high in October. On the decline, Group III touched its low point in December, 1920, while both Group I and Group II continued their downward movements until August, 1921. On the next upward swing, the Group III stocks touched high in November, 1922, four months ahead of Group II. Group I touched high in the spring of 1922

ahead of either Group II or Group III, but inspection of the chart will show that the failure of Group I to rise above this high in 1923 was due to the marked downward trend of this index. Groups II and III turned upward concurrently in 1924.

II. COMPARISON OF THE MOVEMENTS OF INTEREST RATES AND INDUSTRIAL STOCK PRICES SINCE JANUARY, 1919.

For purposes of comparison with stock prices, the movements of interest rates are shown in the chart on p. 102. The rates shown are for call loans and for short time loans at New York City. We shall note the degree of similarity between the movements of each of the three groups of stocks and those of interest rates.

Both the prices of highly speculative stocks and the call loan rate were higher in 1919 than they have been since that time. Call loan rates advanced throughout the greater part of 1919, but the prices of stocks in Group I also advanced. The stocks touched their high point one month before the call loan rates touched theirs. Throughout 1920 and the first half of 1921, both call rates and speculative stocks declined. In August, 1921, with call rates at approximately $5\frac{1}{2}$ per cent, speculative stocks touched their low point. During the next 12 months stocks advanced while call loan rates continued to decline. The lowest monthly average call loan rate was 3.90 per cent. Although the highly speculative

stocks advanced late in 1921 and the first half of 1922, they did not approach the very high prices of 1919. The highest price reached in 1922 was 90.82 as compared with a high price of 181.05 in 1919.

In the autumn of 1922, the call loan rate advanced from about 4 to about 5 per cent, and for the next year it remained near 5 per cent. During that time, stocks declined late in 1922, advanced early in 1923, and then made a precipitate decline in the spring of 1923. Later in the year, stocks made a great advance, while call loan rates still remained in the neighborhood of 5 per cent.

During the first eight months of 1924, call loan rates made a sharp decline from about $4\frac{1}{2}$ per cent to 2 per cent. The stocks in Group I also declined during the first few months of the year, touching their low point in May. The averages of interest rates for the rest of the year showed a considerable advance, but the average price of the speculative stocks for December was much lower than the figures for most months in 1919, 1920, and 1922, when call loan rates were relatively high.

The preceding discussion has been centered on the movements of call loan rates rather than those of short time interest rates. The movements of the two rates during the period since January, 1919, are very similar. Except for seven months in the autumn of 1919 and the winter of 1920, when call loan rates were very high, the rates on the two kinds of loans have not differed by more than 1 per cent.

During most of the period the difference was less than one-half of 1 per cent.

Short time interest rates were above 5 per cent throughout 1919, yet in the first 10 months of that year the highly speculative stocks made a great advance. This group of stocks touched its high point in October. Interest rates continued to advance until October of the next year, 1920.

Short time money rates had been declining for eight months, when Group I touched its low point in 1921. The comparison of short time rates with stock prices need not be carried further because of the close agreement of the two types of interest rates.

The dividend paying common stocks were lower in 1919 when interest rates were high than in later years when interest rates were low. The great similarity of the movements of Group I and Group II has already been discussed. Changes in Group II relate themselves to the movement of the interest rate in much the same way as do changes in Group I. The stocks in Group II advanced with advancing call loan rates in 1919, declined with declining call rates in 1920, and during the first eight months of 1921, advanced while call rates declined for the next 12 months, advanced with advancing call rates in the latter part of 1922, and advanced and declined in 1923 while call rates remained comparatively steady. In 1924, both call rates and Group II stocks declined and then

advanced, but the upturn in stocks preceded that in rates by four months.

The extent of the advance in the prices of Group II stocks in 1922 and 1923 is significant. Although the stocks of this group are all common stocks, they were selected for this group because their dividend rates had been comparatively steady throughout the period. In 1920 and during the first part of 1921, however, traders no doubt feared that some dividends would have to be passed or reduced, and this fact probably accounts for the decline in the price of the stocks at a time when interest rates were declining. With the upward swing in stock prices which began late in 1921, the stocks advanced to higher prices than had prevailed in 1919. As the uncertainty concerning the safety of the dividends disappeared, the prices came more under the influence of the interest rate. With a lower level of interest rates, the higher prices were to be expected.

The prices of high grade preferred stocks reflect changes in the interest rate more closely than do the prices of either of the other groups. The stocks of this group resemble Group II in that they were on a higher level of prices in 1922 and 1923 than they were in 1919. They touched their lowest point in December, 1920, after only a year of declining call loan rates and after only two months of declining short time interest rates. Their high point was touched in November, 1922, after about three months of advancing interest rates. Their decline

in the early part of 1923 followed an advance of about 1 per cent in interest rates. The fluctuations in 1923 and the first part of 1924 were small, but in May, June, July and August of 1924, prices of this group advanced while interest rates declined.

Study of the fluctuations of stock prices and interest rates for the period from 1919 to 1924 fails to reveal any consistent relationship between the two series. A few periods may be selected to support the orthodox theory, such as the second half of 1921 and the first half of 1922, and the summer of 1924. Other periods, however, may be selected to contradict the theory, such as the greater part of 1919 when both stock prices and interest rates advanced to high levels, the second half of 1922 when both series again advanced, all of 1923 when stock prices made a considerable decline and a like recovery while interest rates remained about the same throughout the year, the first part of 1924 when both interest rates and stock prices declined, and the last half of 1924 when both interest rates and stock prices advanced.

The prices of the stocks in the high grade preferred group come nearest to reflecting changes in the interest rate. This group moves ahead of the other groups, and the interval between a major change in the movement of interest rates and a change in the movement of stock prices in the opposite direction is less for this group than for any other. Moreover, the trend of the prices of the

preferred stocks is decidedly upward from 1919 to 1924, while the trend of interest rates is as decidedly downward.

The dividend paying common stocks, in their shorter fluctuations, move with the highly speculative stocks, but the trend of the prices of the dividend payers since 1919 has also been upward, while interest rates were trending downward.

The highly speculative stocks not only fail to show the effect of either minor or major fluctuations of interest rates but also trend downward from 1919 to 1924. The movements of the prices of this group of stocks, therefore, show the least correspondence with the movements of interest rates, both short time and call.

So far as this period and these particular stocks are concerned, we find no justification for the idea that the money market controls speculation, using the latter term in its proper sense. The behavior of Group III, the least speculative group, appears to show a considerable relationship to the movement of interest rates.¹ Group I, the highly speculative group, shows the least influence of money market conditions. Group II, containing securities which are heavily bought both by investors and by persons whose interest in the market is purely speculative, seems to be influenced more by the money market than is Group I, and less than is Group III. Its behavior gives no support to the theory that the

¹See Appendix H.

supply of money is the principal factor in determining its upward and downward swings.

The indexes of stock prices which have heretofore been used to portray the course of speculative activity, including those which we have employed in Chapters II to VIII, are of a character similar to our Group II. They contain very few of the highly speculative non-dividend payers, and practically no very high grade preferred stocks. Their behavior in general supports the same conclusion as does the behavior of our Group II, that is, that if the money market is a factor in determining the level of stock prices, it is a minor factor and one whose operation is frequently obscured by the uncertainty concerning future dividend rates.

CHAPTER X

THE LOGIC OF THE THEORY

IN the preceding chapters we have reviewed in detail such evidence as is available relative to the sequence of fluctuations in the money and security markets. This evidence, we have seen, fails to support the generally accepted theory. Neither the minor changes of interest rates from day to day, the intermediate changes from season to season, nor the longer swings from year to year reflect themselves in the volume and character of speculative activity. Since the facts fail to support the accepted theory the question next arises, why does this theory not work out in practice? Was there ever any reason to anticipate such relationships as the theory calls for?

We shall first consider that phase of the theory which deals with the supposed relationship between the seasonal fluctuations of interest rates and the movement of stock prices; then we shall examine the theoretical effects of changes in interest rates which continue for longer periods, particularly those associated with the business cycle.

I. SEASONAL VARIATIONS IN INTEREST RATES AND STOCK SPECULATION.

The doctrine that low rates on call loans stimulate speculation in stocks, as set forth by most of its advocates, rests on the assumption that when call loan rates decline in times of seasonal dullness, the saving in interest charges makes it profitable to carry securities whose dividend yields are higher than the interest rate.¹ We shall first examine this form of the theory. Those writers who have discussed the supposed influence of seasonal changes in interest rates on stock prices have in general referred to call loan rates rather than to time loan rates, and we shall, therefore, confine our attention to call rates. Most of the argument, however, would apply equally well to the time money market.

The possible earnings due to the difference between the call loan rate and the dividend rate are negligible. Let us assume that the call loan rate remains at 2 per cent, that the dividend rate remains at 6 per cent, and that the prices of stocks remain unchanged, and compute the profit or loss of a trader who carries the stocks. These assumptions are the most favorable to the theory under review. The

¹“When demand loan rates in New York are low, ranging from 2 to 4 per cent, while at the same time standard, dividend-paying stocks are selling on, let us say, a 5 to 6 per cent basis, it becomes profitable for a dealer in securities, who expects rates to continue easy, to borrow money at the prevailing low rates with a view to buying such securities and thus netting the difference between the two rates.” Huebner, S. S., *The Stock Exchange*, 1922, p. 294. See other references in Chapter I of this book.

spread between the call loan rate and the dividend rate is the maximum, and this maximum spread is assumed to be maintained for the entire time (one or two months) involved in the transaction. This does not often occur, however. As will be shown later, the assumption that the prices of stocks remain unchanged for one or two months is also very artificial.

Let it be assumed that a trader buys 100 shares of stock for \$100 each and holds the shares for one month. The interest on this amount ² for one month at 2 per cent is \$16.67. The trader must pay a broker's commission on the purchase of the stock and another on the sale. He must also pay a New York state tax and a federal tax. The trader's account at the close of the transaction will be as follows: ³

² Although the trader will not be able to borrow the full \$10,000 on the collateral, he must allow for interest on the full amount paid for the securities. The money of his own that may be put up as a margin could otherwise have earned at least the prevailing rate for call loans.

³ It is assumed that the trader buys securities of market value of \$100 each. If he buys shares of \$50 each, he would have to purchase 200 shares to receive a dividend of \$50 (6 per cent of \$10,000 for one month). This would require him to pay \$60 in commissions and \$8 in taxes, making his loss on the transaction \$34.67. If he borrows \$10,000 and purchases securities of more than \$100 market value, he would purchase fewer securities and his commissions and taxes would be less. This might change the loss into a profit. The assumption that dividends would be received for one month is, of course, unreal, but the dividend as earned would presumably be reflected in the price of the stock. We have assumed that the speculator would be charged the call loan rate on the funds borrowed for the transaction. In fact he could not secure the funds at that rate. Call loan rates at the Stock Exchange are quoted on the basis of loans for \$100,000. The loan to the speculator would be arranged through the broker who would charge the customer a rate considerably higher than

Dividend on securities for one month at 6 per cent.....	\$50.00
Expenses:	
Interest on \$10,000 for one month at 2 per cent.	\$16.67
Commission paid on purchase of stocks.....	15.00
Commission paid on sale of stocks.....	15.00
State tax	2.00
Federal tax	2.00
Total expenses	50.67
Net loss	\$0.67

The trader could not reduce these expenses by purchasing securities in larger lots than 100 shares, since both commissions and taxes increase proportionately on the larger orders.

This analysis shows why a decline in the call loan rate continuing for a period of one month does not stimulate the purchase of stocks. It might be suggested, however, in defense of the theory, that the trader can hold the stock for two months. Since he would pay commissions and taxes only once, the two months' transaction might show a profit. The trader's account at the end of the two months would be as follows:

Dividend on securities for two months at 6 per cent.....	\$100.00
Expenses:	
Interest on \$10,000 for two months at 2 per cent	\$33.34
Commission on the purchase of stocks.....	15.00
Commission on the sale of stocks.....	15.00
State tax	2.00
Federal tax	2.00
Total expenses	67.34
Profit on the transaction.....	\$32.66

two per cent. The expenses are figured on the basis of the scale of commissions in force before the new scale of somewhat higher rates became effective, November 1, 1924.

This account indicates that the trader has made a net profit of \$32.66 on the 100 shares purchased. This profit amounts to a little less than 33 cents per share.⁴

The spread between the bid and the asked prices would usually wipe out any possible gains from low call loan rates. As the brokers on the floor of the exchange offer to buy or sell securities, the price at which a given stock is offered for sale is usually not the same as the price which is bid for it. When the bid and the asked prices become the same, a sale is made, and then they draw apart again. The bid and the asked prices are changed from time to time, but there is always a spread between them except while a sale is actually being made.

Let us assume that a trader decides to purchase 100 shares of a certain stock as soon as the dividend yield is 4 per cent higher than the interest rate. Let us assume also that the security is quoted at 99 bid, 100 asked, and that the dividend rate is 6 per cent. If the price and dividend rate remain constant he will make his purchase as soon as call money falls to 2 per cent, and he will pay \$100 per share for his stock.

After two months, when the trader has made his profit of 33 cents per share on the saving in the interest charges, call loan rates advance to a point where

⁴The federal tax on stock exchange transactions was not in force before the World War. Without the tax the profit would be 35 cents per share.

he no longer cares to keep his trade open. Accordingly, he orders his broker to sell the security. Let it be assumed that there has been no change in the price of the stock during the two months' period; it is still quoted at 99 bid, 100 asked. Obviously, the sale cannot be made at the same price as that at which the purchase was made. The broker must now sell at the bid price; when he bought he was compelled to pay the asked price. The trader loses one point, or three times his assumed profit.

The assumption that the bid and the asked prices of an active security remain unchanged for two months is, of course, unrealistic. But, if prices of securities are as likely to advance as to decline, the trader will, on the average, lose the difference between the bid and the asked prices.

To illustrate the amount of the spread between the bid and the asked prices, the current quotations on 40 stocks for one day are given in the table on page 118. It will be noted that the spread was as small as one-eighth of a point in the case of only two of these stocks, while in the case of two other stocks the spread was three points. The average spread was a little more than three-fourths of a point.⁵ In our illustrative case, the saving in interest rates for a two-month period, after the payment of all expenses, amounted to 33 cents per share. A loss of three-eighths of a point in the price of the

⁵ The stocks chosen are the first 40 in the alphabetical list. Sales were made in every one of the 40 stocks on that day.

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stock would have wiped out this entire saving. The spread between the bid and the asked prices was less than three-eighths of a point in the case of only 11 of the 40 securities listed in our table. Therefore, even if prices had been unchanged, transactions in most of these securities would have resulted in net losses for the two months.

BID AND ASKED PRICES OF 40 STOCKS ON THE NEW YORK STOCK EXCHANGE, AT THE CLOSE, FEBRUARY 20, 1924.

Name of Stock	Bid	Asked	Spread
Adams Express.....	75	77	2
Advance Rumely.....	9½	10½	1
Advance Rumely, pfd.....	34	37	3
Air Reduction.....	76½	77½	1½
Ajax Rubber.....	7½	7¾	¼
Allied Chemical & Dye.....	67½	68	½
Allied Chemical & Dye, pfd.....	112	113	1
Allis-Chalmers Mfg.....	45¼	45½	½
American Agricultural Chemical.....	12¼	12½	½
American Agricultural Chemical, pfd.....	36	38	2
American Bank Note.....	102	104	2
American Beet Sugar.....	42½	43	½
American Bosch Magneto.....	33	...	...
American Brake Shoe Foundry.....	77½	77¾	½
American Can.....	111½	111¾	¼
American Can, pfd.....	112	112½	½
American Chiclé.....	17½	18¼	¾
American Druggists Syndicate.....	5¾	5¾	¾
American & Foreign Power, pfd.....	95½	95¾	¼
American Hide and Leather.....	11¼	11½	¼
American Hide and Leather, pfd.....	59¼	59¾	½
American Ice.....	89	92	3
American International.....	21	22	1
American La France.....	10¾	11	¼
American Linsced Oil.....	18	19	1
American Locomotive.....	72¼	73	¾
American Metal.....	43½	44¾	¾
American Radiator.....	100¼	100½	¼
American Safety Razor.....	6½	6¾	¼
American Ship and Commerce.....	13½	14	½
American Smelting and Refining.....	61¾	62	¾
American Smelting, pfd.....	99	100	1
American Steel Foundries.....	37½	38	½
American Sugar.....	56½	57	½
American Sumatra Tobacco.....	21	21¾	¾
American Telephone and Telegraph.....	128¾	128¾	½
American Tobacco.....	144	145	1
American Water Works.....	42	42½	½
American Woolen.....	73	73½	½
American Woolen, pfd.....	100	101	1
Average.....			.76

In our analysis of the possible profits arising from a spread between interest rates and dividend yields, we assumed that dividend rates and stock prices remained unchanged for one or two months. Obviously, this assumption cannot be made in practice. If it could be made, the transaction would be purely an investment, not a speculation. To carry on such operations in the stock market, the trader must assume for one or two months the risk of a decline in the price of the security purchased. We shall now inquire whether the risk of an adverse fluctuation in the price of the stock is important as compared with the anticipated profit.

Speculation based on the difference between a dividend yield and call loan rates would involve great risks. To indicate the extent of the day-to-day fluctuations in the prices of stocks we have tabulated the quotations of the common stock of the United States Steel Corporation for one month. December, 1910, was chosen for this purpose because the fluctuations of stock prices for that month were very small. The results are shown in the table on page 120.

The smallest range for any day was three-eighths of a point. A change of this size would be enough to double the trader's paper profit of 33 cents for the two months, or to turn it into a loss. The average daily range for the month was \$1.18½, or more than three times as much as the profit in the interest account for the two months.

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The average variation in the price of the stock in one day is greater than the saving in interest charges for four and a half months. If the trader or speculator could guess the fluctuation of the security correctly for three days, he would make more

HIGH AND LOW PRICES OF UNITED STATES STEEL COMMON STOCK BY DAYS FOR DECEMBER, 1910.

Day of Month	Low Price	High Price	Spread
1	73½	75½	2
2	72⅝	75	2⅜
3	72⅝	73⅝	1
4	Sunday	....	...
5	73	74⅞	1⅞
6	71⅞	74¼	3⅞
7	70⅜	72⅞	1¾
8	70	72⅜	2⅜
9	72⅞	73¼	1⅞
10	72¾	74	1½
11	Sunday	....	...
12	72⅝	73¾	1⅞
13	71⅞	72⅞	1
14	72½	72¼	¾
15	72⅞	73⅞	1
16	71⅞	72⅞	1
17	72⅝	73	⅝
18	Sunday	....	...
19	72⅝	73⅝	1
20	72⅞	73½	⅞
21	72⅝	73¼	⅞
22	72⅞	72⅝	½
23	72	72½	½
24	Holiday	....	...
25	Sunday	....	...
26	Holiday	....	...
27	71⅞	72¼	1⅞
28	70⅝	71⅞	¾
29	71	72⅞	1⅞
30	72⅜	73⅜	1
31	72⅞	72⅝	½
Average	....	....	1.18½

in that time than he could make by the difference in interest rates in a year.

Some proponents of the theory under review contend that the significant thing is not the profit directly attributable to the margin between interest paid and dividends received, but rather the effect of rising and falling interest rates on the cost of speculation. We shall next examine the plausibility of this explanation of the relationship which the theorists assume to exist.

A difference of 1 or 2 per cent per annum in the rate paid for funds has, relatively speaking, very little effect upon a speculator's profits. Let us assume, as before, that a trader borrows money to buy 100 shares of stock of the market value of \$100 per share. Assume also that he makes a profit of five points on the price change in one month and that he pays 4 per cent interest on the money borrowed. His account would be as follows:

Profit of five points on the price of the stock.....	\$500.00
Less commissions and taxes.....	34.00
	<hr/>
Profit after commissions and taxes.....	\$466.00
Interest on \$10,000 for one month at 4 per cent.....	33.34
	<hr/>
Net profit on the transaction.....	\$432.66

If the interest rate should advance to 6 per cent, the net profit of such operations would be reduced slightly, but not enough to restrict speculative activity, as may be seen from the following statement of account:

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Profit after commissions and taxes (same as above)....	\$466.00
Interest on \$10,000 for one month at 6 per cent.....	50.00
	<hr/>
Net profit on the transaction.....	\$416.00

If the trader is speculating for a two months' period, he will expect a change in the price of an active stock of seven or eight points. With the interest rate at 4 per cent, his profit on the transaction for the two months on a seven-point rise in price will be \$599.33 after commissions, taxes, and interest are paid. With the interest rate at 5 per cent, his profit will be \$582.67; and at 6 per cent it will be \$566.00. If the speculator can keep on the right side of the market, the difference in the rate of interest is of minor importance.

Many transactions are effected without any use of funds. Most floor traders speculate for small, quick profits, attempting to make their purchases and sales cancel each other every day.⁶ To the extent that they succeed in doing this they use no capital. Fluctuations in the rate of interest have no effect upon the expenses of floor traders engaged in this sort of trading.

Even when traders on the floor of the exchange do carry stocks for a long period, the fluctuations in the prices of stocks are more important than is the saving in the interest rate. Throughout the preceding discussion, attention has been centered on the outsider who is compelled to pay commissions

⁶ Meeker, J. E., *The Work of the Stock Exchange*, 1922, p. 105. Also Huebner, *The Stock Exchange*, p. 144.

as well as taxes. A trader on the floor saves the commissions, although he has to pay the state and federal taxes. In addition he incurs a clearing charge of \$1.00 on each 100-share purchase. The net saving is considerable as compared with the expenses of the outsider. It is still true, however, that the price fluctuations are far more important than the saving in interest charges.

Seasonal variations of security prices are impossible. If recurrent seasonal changes in interest rates reflect themselves directly in the activities of speculators, the result would be a seasonal fluctuation in stock prices. But such a phenomenon is quite inconsistent with the character of a public speculative market. If seasonal fluctuations in security prices resulted from the seasonal fluctuations in call loans, one would have the secret which so many seek, namely, the way to make a living without work. The call loan rate itself would be the index of the proper time to buy or sell. All that would be required would be to purchase the securities from the hard pressed speculators in September and October, sell them to the same "easy marks" in January and February, buy them back in March and April, and sell again in May and June. One would have no difficulty in deciding when to buy or sell, for the seasonal variations in call loan rates are fairly definite.⁷ The only difficulty would be in keeping

⁷ Rather, were definite during most of the period covered by this investigation.

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the plan a secret; for if the speculators were to discover the success of the system, they themselves would use it. In Chapter II it was shown that no seasonal variations in stock prices do exist. No such variations should have been expected. If a seasonal variation in stock prices did exist, general knowledge of its existence would put an end to it.

II. CYCLICAL VARIATIONS IN INTEREST RATES, AND STOCK SPECULATION.

We now turn to the question whether speculators may not be expected to borrow funds to buy stocks if they believe that dividend rates will remain higher than interest rates for a longer period, say a year or more. In such a transaction the difference between the two rates would still have to cover the buying and selling expenses and the spread between the bid and the asked prices, but might not the transaction nevertheless result in a net profit? Likewise, as interest rates advance, would it not be wise for speculators to sell securities which have been purchased with funds borrowed at low interest rates?

Fluctuations in the prices of stocks are of far more importance than are differences between the interest rate and the dividend rate. Even though a speculator had assurance that the interest rate would be low for a year or more and that dividends would not be decreased, his primary concern would still be the question of price changes. As a basis for comparison we have tabulated the fluctuations of the Dow-Jones

average of industrial stock prices for each calendar year from 1897 to 1921. The table on page 126 shows for each year the highest average price for any day in the year, the lowest average price for any day, the spread between the highest and the lowest average price, and the ratio of this spread to the average price for the year. The average price for the year was computed from the high and low prices for each month of the year.

The fluctuation in the prices of stocks each year is a very high percentage of the average price for the year. For the period from 1897 to 1921 the smallest fluctuation was in 1902, when the difference between the high and the low prices was 13 per cent of the average price. The highest fluctuation was in 1915 when the spread between the high and the low prices was 65 per cent of the average. For the whole period the spread averaged 32 per cent. From these figures it is apparent that fluctuations in price are far more important than the saving of 2, 3 or 4 per cent in the rate of interest. In fact the interest saving is relatively insignificant.

The fluctuations in prices show that speculation on low interest rates would have been very risky. In such years as 1901, 1910, 1911, 1914, and 1917, for example, the prices of stocks declined in spite of low rates on short time loans. The fluctuations of stock prices as compared with the average prices in the years named were 24, 29, 17, 15, and 37 per cent respectively. A speculator might have profited by

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a saving in interest rates in those years, but his success or failure would have depended on his luck or skill in forecasting the amount and direction of the price changes.

FLUCTUATIONS IN THE DOW-JONES DAILY AVERAGE OF INDUSTRIAL STOCK PRICES.

Year	High	Low	Spread	Percentage of Spread to Average Price for the Year
1897.....	55.82	38.49	17.33	38
1898.....	60.97	42.00	18.97	36
1899.....	77.61	58.27	19.34	27
1900.....	71.04	52.96	18.08	29
1901.....	78.26	61.52	16.74	24
1902.....	68.44	59.57	8.87	13
1903.....	66.33	42.15	24.18	43
1904.....	73.23	46.41	26.82	49
1905.....	96.56	68.76	27.80	35
1906.....	103.00	85.18	17.82	19
1907.....	96.37	53.00	43.37	57
1908.....	88.38	58.62	29.76	40
1909.....	100.53	79.91	20.62	22
1910.....	98.34	73.62	24.72	29
1911.....	87.06	72.94	14.12	17
1912.....	94.15	80.15	14.00	16
1913.....	88.57	72.11	16.46	21
1914 ^a	83.43	71.42	12.01	15
1915.....	99.21	54.22	44.99	65
1916.....	110.15	84.96	25.19	26
1917.....	99.18	65.95	33.23	37
1918.....	89.07	73.38	15.69	19
1919.....	119.62	79.15	40.47	41
1920.....	109.88	66.75	43.13	48
1921.....	81.50	63.90	17.60	24

^a Data for 1914 are for the first seven months only. The average price for the year is computed from the monthly high and low figures. Data from Hamilton, W. P., *The Stock Market Barometer*, 1922, pp. 274-325.

III. GENERAL CONSIDERATIONS.

The theory under examination overlooks the fact that in a speculative market what is generally known is discounted. It is always possible to find stocks whose current dividend yields exceed the short time interest rate. If the theory were sound, speculators should always be borrowing funds in unlimited amounts with which to purchase such securities.

When the dividend yield exceeds the interest rate, the difference may be due to any one, or more, of many factors. The earnings of the particular corporation may not be sufficiently large to justify a continuance of the same dividend rate indefinitely. Or if the current earnings are large, the immediate prospect may be for a decline. Again, the low level of interest rates may turn out to be only temporary. These and countless other factors cause differences between dividend yields and the current interest rate.

Increased willingness of speculators to purchase is not alone responsible for advances in stock prices; lessened willingness to sell may cause an advance. The seller of stock is as much interested in profiting from the transaction as the buyer is. Speculative profits do not result from factors known equally well to both parties, when a transaction is entered into. The current interest rate and the current dividend rate are two factors which are generally

known and are discounted in the prices of stocks. To assume that buyers can make profits by the difference between interest rates and dividend yields is to attribute greater intelligence to buyers in general than to sellers in general.

Finally, it may be pointed out that even if it were true throughout the whole period covered by our evidence, that low interest rates preceded advances in stock prices and high interest rates preceded declines, this would not be sufficient evidence that changes in interest rates are a major factor in causing stock market fluctuations. The selection of these two items for comparison oversimplifies the picture.

Transitions from depression to prosperity and back again to depression are characterized by fluctuations in many other factors besides interest rates and stock prices. If data were tabulated with equal care for such factors as wages, consumption of goods, volume of production, corporate earnings, dividend payments, and so forth, many of them probably would show a high correlation with stock prices, either concurrently or with a lag. Many series of economic data, in fact, do vary with industrial stock prices. It is well known that pig iron production, bank clearings, commodity prices, imports of goods, building permits, railroad gross earnings, and dividend payments show a considerable positive correlation with stock prices of a few months earlier, and a negative correlation with stock prices of some months later, and yet we do not attribute the

declines of stock prices to the up-swings of business activity.

It will perhaps prove of some interest, in conclusion, to note the origin of this theory of the relation of changing money rates to stock speculation, which we have demonstrated to be disproved by the facts as well as inherently fallacious. What is the explanation of the general acceptance of this doctrine?

It clearly was not evolved out of inductive study, for it was widely accepted by economists before quantitative tests were applied to the problem. The doctrine is a deduction from broad theoretical premises. Specifically, it is the result of the application of the principles of value to the money market.

It is a generally accepted principle of value that "other things remaining equal, lowering the price of any commodity increases the number of units that will be purchased; and, vice versa, increasing the price reduces the number of units demanded." To use a hallowed illustration: if the price of oranges is 10 cents apiece, X will buy only one orange. If the price is reduced to five cents he may purchase two oranges, and if it is reduced to one cent, "other things remaining equal," he may purchase three or four.

What is true of oranges is held to be equally true of money, which, after all, is only a commodity of commerce. If one has to pay 10 per cent for money to carry stocks he will not be willing to borrow as

much as though he has to pay only 5 per cent ; while if he can procure funds at 1 per cent he can obviously (other things remaining equal) afford to borrow a very great deal. What could be clearer than this?

In evaluating this argument, two qualifications to the conventional theory of value must be considered. In the first place, the theory of the responsiveness of market demand to changes in price does not apply to all commodities alike. In the language of the economists, it is a question of elasticity of demand. A commodity whose market expands readily with falling prices and contracts readily with rising prices, is said to have an elastic demand.

Whether the speculator's demand for call money and short time money is elastic or inelastic is a question of fact. The statistical evidence which we have assembled points to the conclusion that the demand for call money is very inelastic, and the uses to which call money is put are such as to create the same presumption. It seems unlikely that many people who are not already engaged in speculation, would be induced to borrow by the offer of call money at a rate even as low as $\frac{1}{4}$ of 1 per cent, or that persons already engaged in speculation would greatly expand their operations on account of it. To earn even that small return with money repayable on demand, the borrower must purchase securities or speculative commodities and be prepared to liquidate them on demand. There are no oppor-

tunities for such operations which are free from great risk of price changes sufficient to turn the transaction into a loss, even though no interest whatever were paid. Most persons who do not speculate are more or less aware of these risks and their attitude would not be changed by the elimination of the cost of borrowed money. As to those who do speculate with call money, the most important factor determining the volume of their operations is the amount of capital they can provide for margins. Expansion of operations beyond a certain point involves thinning one's margins and very greatly increasing the risk. On the other hand, those who are engaged in the business of stock speculation can afford to pay very high rates rather than to liquidate or curtail accounts which are safely margined and which it would otherwise be profitable to carry. Hence it appears that call money has a very inelastic demand.

In the second place the theory holds that, "other things remaining equal," a change in the interest rate will cause a change in the amount of borrowing for speculation, and hence in the prices of stocks. But, granting this, the question still remains whether for practical purposes other things can remain equal while interest rates are changing. Are interest rates independent of the prosperity of business? Will commodity markets, the prospects of corporate earnings, the hope of increased dividends, the temper of the speculative community, remain unchanged while

interest rates are rising and falling? Low interest rates result from lowered industrial and commercial activity and slack demand for funds. Lowered dividends also result from lessened business activity. Both are characteristic features of business depression. In other words, interest rates decline in times of depression and advance in times of prosperity precisely because "other things" do *not* remain the same.⁸

⁸ This fact has been recognized by a few writers. See the following:

"Cheap money is by no means a 'bull argument' from the stock exchange point of view, because it arises from dull conditions in commerce and industry, and there can be no boom in the securities which represent the nation's business unless mills and factories and railroads are prosperous. There have been more bull markets with tight money, or with money in the neighborhood of 6 per cent, than in cheap money markets." Van Antwerp, W. C., *The Stock Exchange from Within*, 1914, pp. 117-8.

"'Easy Money,' that is, a plentiful supply of credit at low rates, will frequently cause the prices of non-dividend-paying securities to advance, but this is true only when the supply of money is supplemented by good earnings or prospects. Stagnation in general business will release a great deal of credit which will seek employment in safe income-bearing securities, but these same conditions will be highly detrimental to non-productive or speculative securities, as earnings and profits will be adversely affected." Gibson, Thomas, *Annual Forecast*, 1923, pp. 40-41.

The following statement is quoted as illustrating what happens in a period of declining business activity and *low interest rates*:

"The conspicuous trend of industry toward a condition of lessened activity is not conducive to a feeling of optimism in respect to future maintenance of speculative values. Reports of various industrial and railroad companies concerning operations in the first quarter of the year reflect a situation of smaller gross and net earnings as compared with the same period of last year. . . . In many cases, particularly in competitive fields, such as automobiles and steel, for example, the outlook would seem to indicate that the lessening rate of profits must result in a lower rate of dividend payments. It is unquestionably such influences which have been reflected in the speculative division of the stock

In summary, we have examined both the statistical evidence and the theoretical foundations of the doctrine that stock prices are controlled by short time interest rates and call loan rates, and have found no support for the doctrine. We do not contend that there is no relationship between these markets, but we feel certain that interest rates are only one of many factors which determine the course of prices in the stock market.

Purchases of speculative securities made in order to obtain a margin of profit between the dividend yield and the interest cost are of no importance whatever in determining the course of speculation. Aside from the possible influence of the popular belief in the theory we are reviewing, the only importance of changes in the money market is in their bearing on the cost of carrying on such speculative operations as may be entered into for other reasons. Interest is one of the costs which the speculator must carry just as commissions are a cost, and changes in interest rates affect speculation just as do changes in commission rates. Both are probably of negligible importance.

market during the past few weeks." *Magazine of Wall Street*, May 10, 1924, p. 8.

APPENDIX A

MONTHLY RATE OF INTEREST ON CALL LOANS AT THE NEW YORK STOCK EXCHANGE

OUR data on call loan rates for the years from 1866 to 1880 are derived from the monthly high and low figures published by the Harvard Committee on Economic Research (*Review of Economic Statistics*, 1920, Vol. II, July supplement, p. 41). The committee computed these high and low rates from published high and low rates for each week, the week being allocated to the month in which the majority of its days fell. We have computed the means of the two figures to obtain the monthly rates.

For the years from 1881 to 1889 we have computed the items from weekly ranges of call loans published in the *Financial Review*. For the years from 1890 to 1918, the data were taken from the *Review of Economic Statistics*, January, 1919, Vol. I, pp. 102-3. Items for the years 1919 and 1920 were computed from weekly ranges published in the *Financial Review*, and for the years from 1921 to 1924 from ranges given in the *Commercial and Financial Chronicle*. The result is the same as if monthly high and low figures had been computed by the method of averaging described in the preceding paragraph.

CALL LOAN RATES 1866 TO 1924.

(Per cent)

Month	1866	1867	1868	1869	1870	1871	1872	1873	1874
January	5.50	7.00	5.50	18.40	6.15	15.40	14.10	10.55	5.50
February	6.25	5.85	4.70	6.60	5.50	4.50	14.90	18.00	4.10
March	5.60	6.00	16.70	7.00	5.40	4.50	16.40	21.35	4.00
April	5.50	5.90	17.40	6.75	5.50	5.70	36.25	87.50	4.20
May	5.20	4.50	5.70	6.75	4.70	4.10	7.35	6.10	3.15
June	5.00	6.15	3.80	30.10	4.40	3.00	4.50	4.70	2.75
July	4.80	4.50	4.00	6.90	5.00	3.00	3.60	3.70	2.65
August	3.70	4.25	3.70	6.40	5.20	2.55	4.15	4.60	2.50
September ...	4.25	5.60	4.60	7.00	5.50	4.85	35.20	72.05	2.70
October	4.40	11.45	7.35	5.65	5.10	7.05	9.30	31.20	2.95
November ...	6.00	6.50	35.00	6.30	5.40	6.60	12.30	13.50	3.00
December ...	6.50	9.00	20.55	9.60	18.40	18.15	58.65	10.75	3.80

Month	1875	1876	1877	1878	1879	1880	1881	1882	1883
January	2.75	5.25	6.45	7.05	2.60	6.20	4.81	8.56	4.50
February	2.50	3.60	3.30	4.75	3.05	4.65	50.12	9.47	4.12
March	3.95	3.85	2.95	4.90	5.95	15.25	17.15	4.51	10.87
April	3.55	3.70	3.70	6.45	4.40	16.15	4.44	5.39	6.68
May	2.75	3.20	2.45	3.10	3.80	4.05	3.30	3.00	3.55
June	2.35	2.60	1.75	2.60	3.30	3.00	3.19	3.56	2.00
July	2.65	2.05	2.20	1.75	2.95	2.50	3.44	3.00	2.10
August	2.05	1.85	3.25	1.80	9.20	2.65	15.60	3.95	2.62
September ...	2.45	1.95	4.35	2.30	12.55	2.50	7.97	7.87	2.44
October	3.30	3.10	7.15	5.05	40.10	2.85	13.55	6.80	2.70
November ...	4.20	3.95	5.40	3.80	15.80	22.00	8.12	10.75	2.00
December ...	5.10	5.05	8.65	4.50	10.30	11.10	18.28	4.62	2.25

Month	1884	1885	1886	1887	1888	1889	1890	1891	1892
January	1.90	1.18	2.12	4.18	3.50	3.30	7.70	3.90	2.40
February	1.87	1.44	2.06	3.55	2.69	2.31	4.25	2.88	2.00
March	1.75	1.30	2.65	5.05	2.75	3.06	4.25	2.88	2.00
April	2.10	1.37	2.37	6.12	2.62	3.70	4.30	3.30	2.00
May	163.44	1.44	2.87	5.20	1.80	2.44	4.88	4.38	1.50
June	4.00	1.25	3.35	33.26	1.50	3.00	4.75	3.25	1.40
July	1.90	1.31	2.25	4.75	1.40	3.55	4.60	2.20	1.88
August	1.75	1.50	6.05	5.15	1.62	3.87	11.63	2.13	2.05
September ...	1.80	1.55	6.37	5.12	2.81	4.81	6.75	4.50	4.13
October	1.94	2.12	5.06	4.19	2.60	9.60	5.00	4.25	5.63
November ...	1.44	3.44	5.90	4.60	2.56	7.25	7.00	4.38	5.15
December ...	2.25	2.75	28.69	5.00	4.12	9.87	5.00	2.94	6.81

CALL LOAN RATES 1866 TO 1924 (Continued).

(Per cent)

Month	1893	1894	1895	1896	1897	1898	1899	1900	1901
January	4.00	1.02	1.35	4.90	1.78	2.50	2.72	4.15	3.07
February	3.00	1.00	1.50	3.94	1.63	1.78	2.47	2.25	2.00
March	8.20	1.09	2.25	3.50	1.62	2.17	4.10	3.94	2.34
April	4.88	1.13	2.25	3.02	1.50	2.97	5.13	3.06	4.30
May	3.66	1.10	1.32	2.53	1.41	1.95	3.52	2.00	6.88
June	8.88	1.00	1.16	1.94	1.20	1.25	2.63	1.69	4.31
July	7.75	1.00	1.40	2.07	1.19	1.25	4.47	1.53	4.30
August	5.50	1.00	1.03	4.69	1.25	1.70	3.27	1.30	2.44
September ...	3.75	1.00	1.56	5.45	2.22	3.78	6.38	1.61	4.34
October	2.38	1.00	2.17	11.13	2.50	2.25	7.50	3.57	3.55
November ...	1.70	1.03	1.97	6.25	1.81	2.10	7.60	5.06	4.19
December ...	1.16	1.44	4.56	1.95	2.92	2.41	11.13	5.13	6.25

Month	1902	1903	1904	1905	1906	1907	1908	1909	1910
January	4.57	5.75	2.34	2.25	8.65	6.15	4.75	1.81	4.72
February	2.38	2.88	1.81	2.19	4.63	4.38	1.81	2.25	2.78
March	3.94	6.00	1.75	3.20	4.88	6.38	1.85	1.85	2.88
April	5.10	4.19	1.38	3.25	9.50	2.35	1.72	1.94	3.28
May	5.56	2.44	1.55	2.42	4.15	2.31	1.66	1.84	3.63
June	2.84	3.05	1.13	2.50	3.25	3.13	1.52	1.87	2.77
July	3.52	2.50	1.03	2.31	2.97	4.55	1.22	2.06	2.41
August	3.78	2.03	.90	2.05	4.44	3.06	1.06	2.17	1.55
September ...	10.80	2.32	1.53	3.56	9.38	4.00	1.35	2.69	2.00
October	7.63	2.69	2.03	5.31	5.15	21.00	1.44	4.31	3.13
November ...	4.88	5.19	2.80	7.70	7.50	12.25	1.75	4.65	3.23
December ...	6.81	5.50	3.13	16.50	14.00	14.60	2.90	5.03	3.38

Month	1911	1912	1913	1914	1915	1916	1917	1918	1919
January	3.18	2.43	3.23	2.38	2.13	1.88	2.05	4.10	4.62
February	2.28	2.28	3.31	1.78	1.97	1.88	2.41	4.99	5.06
March	2.28	2.42	4.19	1.91	1.93	1.91	2.28	5.19	4.87
April	2.30	3.00	3.43	1.83	2.09	2.09	2.47	4.28	5.40
May	2.31	2.75	2.75	1.78	1.94	2.28	3.08	5.16	5.25
June	2.40	2.75	2.25	1.84	1.85	2.97	4.66	5.00	6.62
July	2.36	2.88	2.25	2.65	1.88	3.13	3.23	5.63	6.55
August	2.31	2.84	2.25	6.25	1.78	2.33	3.09	5.88	5.12
September ...	2.28	2.63	2.90	6.00	1.78	2.78	4.53	6.00	6.00
October	2.33	5.33	3.69	6.00	1.81	2.60	4.00	6.00	7.94
November ...	2.72	6.38	3.75	5.41	1.88	3.13	4.17	5.84	11.06
December ...	4.03	6.50	4.63	3.38	1.94	4.44	5.16	5.31	8.85

CALL LOAN RATES 1866 TO 1924 (Continued).
(Per cent)

Month	1920	1921	1922	1923	1924
January	7.81	6.87	4.55	4.25	4.50
February	9.94	7.12	4.81	4.91	4.50
March	8.05	6.60	4.19	5.25	4.00
April	7.19	6.37	4.25	5.00	4.30
May	7.00	6.95	4.17	4.80	3.34
June	7.70	5.81	3.98	5.00	2.25
July	8.12	5.44	3.90	5.00	2.15
August	7.30	5.45	4.00	4.88	2.00
September	7.00	5.19	4.50	4.84	2.12
October	7.81	5.19	5.05	4.70	2.45
November	7.75	5.00	4.81	4.81	2.62
December	7.00	5.31	4.72	4.94	3.65

APPENDIX B

THE 50-YEAR INDEX OF INDUSTRIAL STOCK PRICES

THE index of industrial stock prices, 1872-1922, was computed by the Reports Department of the Federal Reserve Bank of New York. The following statement of the methods used was prepared by the Reports Department of the Bank:

"From 1897 to the present time the index used is based upon the Dow-Jones index of industrial stocks. The method used in compiling the index previous to the beginning of the Dow-Jones index was to work backwards in time from 1897. The Dow-Jones index for the first year (1897) was based upon twelve stocks. Figures for two of these stocks were unavailable previous to 1897, however, and were dropped from the average thus leaving ten stocks previous to that year.

"As the average was worked back from year to year it was necessary to substitute other stocks for those whose figures became unavailable or, in some cases, unrepresentative. In making these substitutions an effort was made to select active representative stocks selling over a period at about the same prices as those of the stocks being dropped, and quotations on which would be available for over a comparatively large number of years previous to substitutions.

"In some cases it was necessary to substitute a stock

which was selling at near double or half the value of the stock to be dropped. Consistency was maintained in the index in such cases by either increasing or decreasing by one the theoretical number of stocks used in compiling the index.

"The average used was a plain arithmetic average of the high and low prices each month for the number of stocks used in the index. No attempt at weighing was made, nor was there any allowance for cash or stock dividends or rights since stock dividends, etc., were comparatively rare and usually of small amounts previous to 1897.

"With regard to the averaging of the Dow-Jones index since 1897 a simple arithmetic average of the high and low points each month for the twelve stocks was used until the Exchange was closed in the latter part of 1914. When the market reopened the number of stocks used in the Dow-Jones index was changed from twelve to twenty and there was a consequent disparity between the two series. In a study of this matter over a period of several years the Review of Economic Statistics has showed the old average to be very nearly $33\frac{1}{3}$ per cent higher than the new index. The present method of computing our index, therefore, is to average the high and low figures of the Dow-Jones index of twenty stocks and to add one-third to this figure. This method has been used from January 1, 1915, up to the present time."

COMPONENT STOCKS OF THE 50-YEAR INDEX

I. DOW-JONES LIST, 1897

American Cotton Oil

American Spirits

American Sugar
 American Tobacco
 Chicago Gas
 General Electric
 Laclede Gas
 National Lead
 Pacific Mail
 Standard Rope and Twine
 Tennessee Coal & Iron
 United States Leather, pfd.

II. WITHDRAWALS AND SUBSTITUTIONS, 1897-1872

Date	Stock Withdrawn	Price	Stock Substituted	Price
1897	Standard Rope & Twine .....	...	.....	...
1897	American Spirits.....	...	.....	...
1894	United States Leather, pfd. ....	...	Western Union.....	...
1892	American Tobacco....	110	American Telegraph & Cable	87
1892	General Electric.....	110	American Express....	120
1891	American Sugar.....	75	Oregon Railway & Navigation	73
1889	Laclede Gas.....	20	Homestake Mining....	10
1889	National Lead.....	28	Ontario Silver Mining	35
1887	American Cotton Oil..	35	Consolidated Coal....	25
1887	Chicago Gas.....	36	Colorado Coal & Iron	35
1887	American Telegraph & Cable	75	Pullman Palace Car..	157
1886	Tennessee Coal.....	48	Delaware & Hudson Canal	102
1880	Ontario Silver Mining	35	Quicksilver Mining....	17
1880	Colorado Coal & Iron	30	Atlantic & Pacific Telegraph	44
1879	Oregon Railway & Navigation	119	Adams Express.....	114
1878	Homestake Mining...	30	Quicksilver Mining, pfd.	45
1878	Pullman Palace Car..	93	{American Express....	55
			{United States Express	100
1873	Atlantic & Pacific Telegraph	17	Maryland Coal	20

III. FINAL LIST, 1872

Adams Express
American Express
Consolidated Coal
Delaware & Hudson Canal
Maryland Coal
Pacific Mail
Quicksilver Mining
Quicksilver Mining, pfd.
United States Express
Wells Fargo Express
Western Union

The Dow-Jones list of 1897 and the subsequent substitutions will be found in Hamilton, W. P., *The Stock Market Barometer*, 1922, Appendix, pp. 269-73.

INDUSTRIAL STOCK PRICES

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INDEX OF INDUSTRIAL STOCK PRICES, 1872-1922.

Month	1872	1873	1874	1875	1876	1877	1878	1879	1880
January	50	59	51	52	50	43	40	40	53
February	51	60	53	51	52	41	41	41	54
March	55	58	53	53	50	39	41	41	55
April	58	57	51	52	48	37	42	42	54
May	59	56	51	51	48	37	42	44	50
June	59	55	51	48	48	36	43	43	50
July	60	55	51	48	48	36	43	42	53
August	59	54	52	48	45	38	42	42	54
September	57	48	53	48	43	41	43	44	56
October	60	43	53	48	43	41	43	50	56
November	59	42	55	49	43	41	43	52	55
December	60	48	54	50	43	41	42	52	56

Month	1881	1882	1883	1884	1885	1886	1887	1888	1889
January	63	60	58	50	42	55	57	53	58
February	68	60	57	51	43	56	57	53	60
March	68	60	57	51	44	55	58	51	61
April	66	60	58	48	44	54	60	51	60
May	69	60	58	43	46	53	60	53	61
June	72	59	59	42	46	55	58	52	63
July	69	62	57	44	46	56	56	53	61
August	67	64	55	47	49	56	53	55	62
September	67	64	55	45	49	57	53	56	63
October	65	62	53	45	53	58	52	57	62
November	65	60	53	44	57	59	53	58	62
December	62	59	51	44	57	57	53	58	62

Month	1890	1891	1892	1893	1894	1895	1896	1897	1898
January	63	52	62	72	44	47	45	42	49
February	59	53	62	70	45	46	48	41	48
March	57	53	63	65	48	48	48	41	50
April	58	54	64	63	50	52	50	39	50
May	62	54	65	51	49	57	48	40	51
June	61	52	65	48	50	58	45	43	52
July	61	51	65	41	50	55	38	47	53
August	59	51	67	40	53	55	35	52	58
September	57	55	67	45	53	56	41	54	57
October	55	55	69	49	50	54	44	50	54
November	51	55	69	48	51	49	49	47	56
December	49	58	67	44	50	45	47	50	59

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INDEX OF INDUSTRIAL STOCK PRICES, 1872-1922 (Continued).

Month	1899	1900	1901	1902	1903	1904	1905	1906	1907
January	63	66	68	64	65	49	70	99	94
February	65	66	69	65	67	48	74	98	92
March	70	64	69	66	65	48	78	95	83
April	75	63	73	67	63	49	80	94	83
May	72	59	72	66	62	48	75	90	81
June	71	57	77	65	58	49	75	91	79
July	72	57	73	66	54	51	80	89	81
August	75	58	72	66	51	54	82	94	74
September ...	75	56	70	66	49	56	80	95	71
October	73	58	65	65	45	61	82	95	63
November ...	75	64	66	63	44	68	85	94	56
December ...	67	68	63	62	47	70	93	94	59

Month	1908	1909	1910	1911	1912	1913	1914	1915	1916
January	63	86	95	83	81	85	81	76	126
February	60	83	88	85	81	81	82	75	125
March	66	84	92	83	85	80	82	78	124
April	69	87	89	83	90	81	80	89	120
May	73	90	87	85	89	79	80	88	120
June	73	92	84	86	89	75	81	91	121
July	77	95	78	86	89	77	77	96	118
August	83	98	79	82	91	80	*	106	121
September ...	81	98	79	77	92	82	*	114	130
October	82	98	83	77	92	79	*	123	136
November ...	86	98	84	80	91	77	*	126	144
December ...	86	98	81	81	88	77	73	129	131

* Stock Exchange Closed.

Month	1917	1918	1919	1920	1921	1922
January	130	102	109	141	100	108
February	121	107	110	129	101	112
March	126	104	116	131	100	116
April	125	104	122	133	103	122
May	125	108	133	122	102	125
June	129	107	138	122	92	125
July	124	109	146	121	92	127
August	118	109	138	114	89	132
September ...	112	110	144	115	93	132
October	105	115	152	113	96	...
November ...	95	112	149	106	101	...
December ...	94	110	141	96	106	...

APPENDIX C

INDEX NUMBERS OF PRICES OF 10 RAILROAD COMMON STOCKS

THIS index was computed by Mr. Edwin Frickey for the Harvard Committee on Economic Research (*Review of Economic Statistics*, 1920, Vol. II, July supplement, p. 33). Stocks included are:

- Chicago & Northwestern
- Chicago, Milwaukee & St. Paul
- Chicago, Rock Island & Pacific
- Cleveland, Columbus, Cincinnati & Indianapolis
- Delaware, Lackawanna & Western
- Illinois Central
- Lake Shore & Michigan Southern
- Michigan Central
- Morris & Essex
- New York, New Haven & Hartford

INDEX NUMBERS.

(Base: average for 1866-80 = 100.)

Month	1866	1867	1868	1869	1870	1871	1872	1873	1874	1875	1876	1877	1878	1879	1880
January	100	96	104	120	113	112	114	113	99	93	90	67	72	84	118
February	95	94	107	119	115	114	114	114	102	91	91	61	70	87	120
March	94	91	109	118	114	118	118	113	99	92	92	60	73	84	123
April	96	87	109	120	116	121	119	110	94	93	86	53	78	87	121
May	97	89	112	125	121	123	118	112	90	88	82	56	78	91	113
June	100	92	114	124	122	122	117	108	90	86	84	51	80	94	114
July	100	99	116	120	117	118	116	107	89	86	82	55	77	96	109
August	105	100	115	124	116	119	114	106	88	88	76	63	72	99	124
September	104	97	116	115	116	120	113	96	89	85	71	71	75	102	126
October	110	97	120	113	118	113	113	93	90	84	73	75	75	111	133
November	108	91	114	113	118	112	112	81	92	87	70	72	76	117	140
December	105	102	118	113	114	113	114	92	93	87	69	71	76	116	146

APPENDIX D

NUMBER OF SHARES SOLD ON THE NEW YORK STOCK EXCHANGE, 1881 TO 1913 *

(Monthly Items in Units of 10,000 Shares.)

Month	1881	1882	1883	1884	1885	1886	1887	1888	1889
January	1300	1131	818	1009	713	867	815	393	487
February	1213	830	862	912	741	941	721	315	593
March	1084	1282	597	629	654	1015	715	525	615
April	819	989	858	916	449	641	947	761	482
May	1238	596	730	1201	507	664	656	621	716
June	863	925	762	919	444	711	699	383	678
July	861	828	554	725	793	507	466	468	563
August	687	910	905	750	687	505	639	474	506
September ...	635	839	907	602	590	854	738	732	564
October	961	1026	1156	680	1266	1074	830	674	758
November ...	798	1361	637	544	1327	1088	750	534	698
December ...	942	913	919	792	1084	1214	516	638	564

* Data for the years from 1881 to 1884 are taken from the *New York Journal of Commerce*; for 1885 to 1902 from the *Financial Review*; and for 1903 to 1913 from the *Review of Economic Statistics*, January, 1919, Vol. I, p. 78.

Month	1890	1891	1892	1893	1894	1895	1896	1897
January ..	635	562	999	1058	452	324	454	337
February ..	520	328	1143	1074	317	302	520	280
March	450	365	893	739	476	513	459	504
April	508	718	682	627	402	504	406	357
May	1105	629	618	897	481	893	280	334
June	544	398	537	482	340	603	437	644
July	301	315	361	590	280	585	556	690
August	414	585	445	490	503	527	427	1144
September..	514	1118	685	472	406	682	457	1314
October ...	726	674	704	632	389	525	493	802
November..	897	535	584	546	455	505	590	582
December..	514	678	835	489	407	694	387	746

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(Monthly Items in Units of 10,000 Shares.)

Month	1898	1899	1900	1901	1902	1903	1904	1905
January ...	929	2425	984	3029	1478	1600	1226	2079
February ..	895	1611	1020	2190	1299	1092	879	2524
March	1009	1774	1445	2706	1196	1510	1144	2914
April	598	1699	1477	4172	2657	1229	821	2930
May	919	1496	952	3529	1353	1247	529	2052
June	917	1090	731	1980	783	1540	497	1258
July	479	839	623	1602	1635	1490	1246	1327
August	1211	1299	402	1077	1431	1437	1247	2021
September..	938	1245	517	1399	2097	1080	1877	1601
October ...	746	1090	1090	1404	1636	1290	3257	1767
November..	1100	1368	2257	1801	1713	1073	3198	2682
December..	1528	1706	2341	1675	1572	1523	2809	3153

Month	1906	1907	1908	1909	1910	1911	1912	1913
January ...	3851	2270	1659	1728	2454	1042	1091	875
February ..	2170	1647	984	1234	1801	1019	709	676
March	1947	3221	1594	1365	1499	682	1455	723
April	2433	1924	1105	1906	1409	537	1596	846
May	2403	1583	2098	1650	1192	1112	1366	546
June	2034	975	965	2032	1629	1051	722	959
July	1635	1281	1386	1281	1425	548	716	512
August	3180	1556	1888	2464	1039	1499	895	609
September..	2602	1222	1758	1998	767	1740	1011	768
October ...	2189	1733	1427	2174	1345	1094	1417	740
November..	1940	968	2497	1877	1071	1492	873	377
December..	2046	1264	2300	1756	982	906	1263	715

APPENDIX E

INTEREST RATES, SHARES SOLD, AND INDUSTRIAL STOCK PRICES, 1906, 1908, AND 1910.

(Daily Items)

January, 1906				February, 1906			
Day	Call Loan Rate (percent)	Shares Sold (thou- sands)	Stock Prices (aver- ages)	Day	Call Loan Rate (percent)	Shares Sold (thou- sands)	Stock Prices (aver- ages)
1...	Holiday	....	....	1...	4¼	1,684	100.55
2...	60	1,576	95.00	2....	4	1,428	101.71
3...	15	1,340	95.63	3....	4	846	99.77
4...	6	1,364	94.44	4....	Sunday	....	....
5...	3	1,324	96.09	5....	3¾	998	100.05
6...	3	1,071	97.09	6....	4½	956	100.39
7...	Sunday	....	....	7....	3½	756	99.60
8...	8	1,613	98.03	8....	4	933	99.50
9...	5	1,322	97.85	9....	3¾	942	99.93
10...	4½	1,318	98.09	10....	3¾	464	99.76
11...	3½	1,537	99.06	11....	Sunday	....	....
12...	4	1,990	100.25	12....	Holiday	....	....
13...	4	977	99.79	13....	4½	1,001	100.08
14...	Sunday	....	....	14....	4½	925	99.27
15...	6	1,535	100.80	15....	3	1,152	97.88
16...	5	1,276	100.81	16....	3¾	1,161	97.31
17...	4	1,724	101.67	17....	3¾	569	96.51
18...	5	1,479	102.26	18....	Sunday	....	....
19...	4	1,895	103.00	19....	3	1,076	97.31
20...	4	889	102.72	20....	5	1,192	97.07
21...	Sunday	....	....	21....	3	1,048	96.25
22...	4	1,686	102.37	22....	Holiday	....	....
23...	4¼	1,967	102.50	23....	4¾	623	96.76
24...	4½	1,975	102.53	24....	4¾	309	96.87
25...	4½	1,602	102.66	25....	Sunday	....	....
26...	4	1,336	102.90	26....	3¾	834	97.38
27...	4	734	101.86	27....	4½	857	96.44
28...	Sunday	....	....	28....	6½	1,420	93.94
29...	3½	1,655	99.32				
30...	4½	2,024	98.31				
31...	4	1,514	100.69				

* Call loan rates and number of shares sold were taken direct from the *Wall Street Journal*. The index of security prices (Dow-Jones average) was taken from the reprint in Hamilton, W. P., *The Stock Market Barometer*, 1922, Appendix, pp. 269-73.

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March, 1906				April, 1906			
Day	Call Loan Rate (percent)	Shares Sold (thou- sands)	Stock Prices (aver- ages)	Day	Call Loan Rate (percent)	Shares Sold (thou- sands)	Stock Prices (aver- ages)
1...	4	889	93.83	1....	Sunday	....	....
2...	4	824	93.86	2....	7	1,261	97.84
3...	4	443	93.85	3....	10	....	98.19
4...	Sunday	....	....	4....	15	916	97.48
5...	5¾	1,479	92.90	5....	22	739	97.00
6...	5¼	991	94.00	6....	6	904	97.09
7...	4	672	94.09	7....	6	307	96.56
8...	5	866	94.69	8....	Sunday	....	....
9...	3½	1,173	96.43	9....	11	721	95.93
10...	3½	481	96.33	10....	18½	1,010	95.05
11...	Sunday	....	....	11....	2	934	96.44
12...	4	731	96.40	12....	2½	666	96.02
13...	4¼	863	96.96	13....	3	411	96.51
14...	4¼	611	96.44	14....	3	435	97.02
15...	4	505	95.79	15....	Sunday	....	....
16...	3	541	95.33	16....	2¾	852	97.01
17...	3	131	95.10	17....	3½	823	96.84
18...	Sunday	....	....	18....	3½	1,246	95.67
19...	3½	749	93.05	19....	3½	1,542	94.23
20...	5¼	623	94.35	20....	5½	1,194	95.29
21...	4¾	663	94.38	21....	5½	399	95.25
22...	4½	689	94.96	22....	Sunday	....	....
23...	3½	729	95.06	23....	3½	1,185	93.46
24...	3⅞	207	94.77	24....	3½	1,237	93.60
25...	Sunday	....	....	25....	4	915	93.02
26...	3½	763	96.25	26....	2	1,381	92.44
27...	4½	882	95.82	27....	4	1,791	89.92
28...	4½	840	96.64	28....	4	1,006	88.70
29...	6¼	704	96.43	29....	Sunday	....	....
30...	5	775	96.60	30....	3	1,238	90.53
31...	5	445	96.95				

RATES, SHARES SOLD, AND PRICES 151

May, 1906				June, 1906			
Day	Call Loan Rate (percent)	Shares Sold (thousands)	Stock Prices (averages)	Day	Call Loan Rate (percent)	Shares Sold (thousands)	Stock Prices (averages)
1...	9	1,427	88.03	1....	4	364	94.01
2...	4¼	2,464	87.16	2....	4	227	94.38
3...	3½	1,358	86.45	3....	Sunday	....	....
4...	4	1,539	89.08	4....	2¾	804	95.19
5...	4	712	89.75	5....	2¾	834	95.04
6...	Sunday	....	....	6....	2¾	618	95.21
7...	4	1,179	90.78	7....	2¾	856	95.12
8...	3	1,334	92.08	8....	3	581	94.50
9...	3	1,312	92.86	9....	3	305	93.99
10...	3¾	1,039	93.21	10....	Sunday	....	....
11...	3	1,217	93.41	11....	3	514	94.38
12...	3	441	93.13	12....	3	632	94.10
13...	Sunday	....	....	13....	3¾	547	93.63
14...	3½	1,055	92.80	14....	3¾	1,207	92.91
15...	3¾	1,122	93.06	15....	3	982	92.25
16...	3¾	854	93.77	16....	3	450	91.02
17...	3	1,026	93.05	17....	Sunday	....	....
18...	3	584	92.75	18....	3	1,069	90.66
19...	3	148	92.68	19....	2½	1,013	91.43
20...	Sunday	....	....	20....	3½	984	92.00
21...	2¾	358	92.20	21....	1½	1,027	90.55
22...	3	451	92.15	22....	1½	906	90.95
23...	3	779	92.16	23....	1½	392	89.85
24...	3	766	92.76	24....	Sunday	....	....
25...	4	1,091	93.42	25....	2¾	995	89.02
26...	4	252	93.15	26....	3¾	1,178	89.38
27...	Sunday	....	....	27....	3	1,120	87.71
28...	1⅞	475	93.29	28....	3	1,221	88.70
29...	2	425	93.69	29....	5½	977	87.29
30...	Holiday	....	....	30....	5½	545	87.01
31...	3	518	93.75				

152 INTEREST RATES AND SPECULATION

July, 1906				August, 1906			
Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)	Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)
1...	Sunday	.....	.....	1....	2	1,338	93.72
2...	6	1,119	86.12	2....	2½	1,293	93.37
3...	2	832	86.64	3....	2¾	985	92.44
4...	Holiday	.....	.....	4....	2¾	347	91.67
5...	2	823	86.58	5....	Sunday	.....	.....
6...	2¼	692	87.79	6....	2¼	646	92.85
7...	2¼	415	87.97	7....	2¾	764	92.97
8...	Sunday	.....	.....	8....	2¾	641	92.10
9...	2½	500	87.87	9....	4	810	91.70
10...	2½	303	87.26	10....	3¼	474	91.92
11...	2¾	502	86.37	11....	3¼	398	92.03
12...	2½	931	85.70	12....	Sunday	.....	.....
13...	2½	607	85.18	13....	2¾	698	92.53
14...	2½	201	85.40	14....	3¼	613	92.70
15...	Sunday	.....	.....	15....	3¼	978	92.94
16...	2	680	86.45	16....	3½	1,224	92.59
17...	1	414	86.91	17....	3	2,525	93.38
18...	2	410	86.54	18....	3	1,603	95.34
19...	2	342	87.21	19....	Sunday	.....	.....
20...	2¼	888	88.12	20....	4½	2,732	95.96
21...	2¼	326	88.51	21....	6	1,940	95.60
22...	Sunday	.....	.....	22....	6	1,575	95.09
23...	3¼	964	88.59	23....	3½	1,343	95.36
24...	2	607	88.12	24....	3¾	1,407	96.07
25...	2⅙	753	89.59	25....	3¾	1,058	96.08
26...	2¼	899	90.03	26....	Sunday	.....	.....
27...	2	1,077	91.41	27....	4½	1,305	95.19
28...	2	470	91.80	28....	4½	1,597	94.61
29...	Sunday	.....	.....	29....	5	1,570	94.89
30...	2½	886	91.72	30....	6½	1,346	94.31
31...	2	691	92.41	31....	11	584	94.01

RATES, SHARES SOLD, AND PRICES 153

January, 1908				February, 1908			
Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)	Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)
1...	Holiday	.....	.....	1....	2	323	61.83
2...	18½	508	59.61	2....	Sunday	.....	.....
3...	8	636	60.62	3....	2	452	61.82
4...	8	256	60.87	4....	2	264	62.14
5...	Sunday	.....	.....	5....	2	451	61.02
6...	6	627	61.75	6....	2	407	61.15
7...	6	539	61.42	7....	1¾	316	60.77
8...	6	469	61.75	8....	1¾	432	59.90
9...	5½	801	63.50	9....	Sunday	.....	.....
10...	5½	1,030	63.01	10....	2	953	58.80
11...	5½	386	64.27	11....	1¾	569	59.11
12...	Sunday	.....	.....	12....	Holiday	.....	.....
13...	4½	911	64.98	13....	2	654	58.62
14...	4¼	918	65.84	14....	1¾	589	59.73
15...	4	733	65.44	15....	1¾	424	59.17
16...	4	944	64.19	16....	Sunday	.....	.....
17...	3	839	64.53	17....	1¾	510	58.88
18...	3	527	64.45	18....	1¾	395	58.84
19...	Sunday	.....	.....	19....	2	522	59.08
20...	2¾	832	63.19	20....	1¾	632	59.68
21...	2½	983	63.21	21....	1¾	416	60.20
22...	2¼	731	62.10	22....	Holiday	.....	.....
23...	2	579	61.44	23....	Sunday	.....	.....
24...	2	510	61.31	24....	1¾	308	60.00
25...	2	239	61.76	25....	1¾	297	59.92
26...	Sunday	.....	.....	26....	1¾	216	59.98
27...	1¾	635	62.06	27....	1¾	257	60.16
28...	1¾	544	62.53	28....	1¾	305	61.07
29...	1¾	584	62.08	29....	1¾	208	60.54
30...	1¾	378	62.32				
31...	2	351	62.70				

154 INTEREST RATES AND SPECULATION

March, 1908				April, 1908			
Day	Call Loan Rate (percent)	Shares Sold (thousands)	Stock Prices (averages)	Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)
1...	Sunday	.....	.....	1....	2	555	67.84
2...	2	299	61.09	2....	1¾	461	67.82
3...	1¾	386	60.97	3....	1¾	389	67.22
4...	2	319	61.19	4....	1¾	220	67.15
5...	2	298	61.29	5....	Sunday	.....	.....
6...	2	287	61.68	6....	1¾	288	67.04
7...	2	451	63.23	7....	1¾	259	67.48
8...	Sunday	.....	.....	8....	1¾	455	67.81
9...	2	677	63.66	9....	1¾	557	68.64
10...	2	564	63.50	10....	1¾	614	68.76
11...	2	956	63.87	11....	1¾	228	68.47
12...	2	610	64.13	12....	Sunday	.....	.....
13...	2	662	65.15	13....	1¾	354	68.17
14...	2	662	66.11	14....	1½	273	68.52
15...	Sunday	.....	.....	15....	1¾	241	68.01
16...	1¾	792	65.23	16....	1¾	294	68.44
17...	1¾	674	65.78	17....	Holiday	.....	.....
18...	1¾	888	65.07	18....	"	.....	.....
19...	1¾	613	65.77	19....	Sunday	.....	.....
20...	1¾	559	66.41	20....	1½	304	67.94
21...	1¾	446	67.26	21....	1¾	328	68.32
22...	Sunday	.....	.....	22....	1¾	336	68.38
23...	1¾	701	68.32	23....	1¾	591	69.10
24...	2	949	69.08	24....	1¾	876	70.01
25...	2	779	69.92	25....	1¾	399	69.93
26...	1¾	983	69.43	26....	Sunday	.....	.....
27...	2	751	69.78	27....	1¾	732	69.80
28...	2	400	68.69	28....	1¾	1,117	70.23
29...	Sunday	.....	.....	29....	1¾	1,085	70.29
30...	1¾	617	68.64	30....	1¾	577	69.55
31...	1¾	695	67.51				

May, 1908				June, 1908			
Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)	Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)
1...	2	644	69.92	1....	1 $\frac{3}{4}$	989	74.38
2...	2	409	70.05	2....	1 $\frac{1}{2}$	968	74.03
3...	Sunday	....	....	3....	1 $\frac{3}{4}$	864	73.89
4...	1 $\frac{3}{4}$	628	69.78	4....	1 $\frac{3}{4}$	700	72.66
5...	2	440	70.62	5....	1 $\frac{1}{2}$	366	73.16
6...	1 $\frac{3}{4}$	751	71.09	6....	1 $\frac{1}{2}$	200.6	73.67
7...	1 $\frac{3}{4}$	673	70.91	7....	Sunday	....	....
8...	1 $\frac{3}{4}$	919	71.26	8....	1 $\frac{3}{4}$	412	73.38
9...	1 $\frac{3}{4}$	497.3	71.78	9....	1 $\frac{1}{2}$	182	72.91
10...	Sunday	....	....	10....	1 $\frac{1}{2}$	186	73.40
11...	1 $\frac{3}{4}$	1,061	72.47	11....	1 $\frac{1}{2}$	149	73.42
12...	1 $\frac{3}{4}$	860	72.30	12....	1 $\frac{1}{2}$	483	72.82
13...	1 $\frac{1}{2}$	814	73.09	13....	1 $\frac{1}{2}$	179.5	72.90
14...	1 $\frac{3}{4}$	1,219	73.95	14....	Sunday	....	....
15...	1 $\frac{3}{4}$	1,218	74.38	15....	1 $\frac{1}{2}$	175	72.93
16...	1 $\frac{3}{4}$	576.5	74.56	16....	1 $\frac{1}{2}$	307	73.48
17...	Sunday	....	....	17....	1 $\frac{1}{2}$	326	73.12
18...	1 $\frac{3}{4}$	1,123	75.12	18....	1 $\frac{1}{2}$	294	73.55
19...	1 $\frac{3}{4}$	1,254	73.78	19....	1 $\frac{1}{2}$	450	72.65
20...	1 $\frac{3}{4}$	1,404	73.83	20....	1 $\frac{1}{2}$	110.3	72.71
21...	1 $\frac{1}{2}$	1,118	74.21	21....	Sunday	....	....
22...	1 $\frac{3}{4}$	968	73.73	22....	1 $\frac{1}{2}$	422	71.71
23...	1 $\frac{3}{4}$	749.1	72.43	23....	1 $\frac{1}{2}$	384	71.70
24...	Sunday	....	....	24....	1 $\frac{1}{2}$	202	71.90
25...	1 $\frac{3}{4}$	836	73.04	25....	1 $\frac{1}{4}$	234	72.33
26...	1 $\frac{3}{4}$	707	72.40	26....	1 $\frac{1}{4}$	203	72.34
27...	1 $\frac{3}{4}$	893	72.64	27....	1 $\frac{1}{4}$	120.2	72.22
28...	1 $\frac{3}{4}$	682	72.15	28....	Sunday	....	....
29...	1 $\frac{3}{4}$	457	72.76	29....	1 $\frac{1}{4}$	345	72.91
30...	Holiday	....	....	30....	1 $\frac{1}{4}$	179	72.59
31...	Sunday	....	....		

156 INTEREST RATES AND SPECULATION

July, 1908				August, 1908			
Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)	Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)
1...	1½	148	72.76	1....	1	471.7	80.57
2...	1¼	100	72.87	2....	Sunday	...	....
3...	1¼	71	73.12	3....	1	576	81.07
4...	Holiday	...	....	4....	1	829	82.13
5...	Sunday	...	....	5....	1	774	82.07
6...	1¼	495	74.50	6....	1	811	83.80
7...	1¼	508	74.84	7....	1	...	84.46
8...	1¼	623	75.83	8....	1	540.1	84.89
9...	1¼	644	76.37	9....	Sunday	...	....
10...	1¼	543	75.63	10....	1	920	85.40
11...	1¼	242.9	75.34	11....	1¼	870	84.43
12...	Sunday	...	....	12....	1¼	802	84.69
13...	1¼	384	76.06	13....	1	702	83.71
14...	1¼	446	76.87	14....	1	1,195	82.08
15...	1¼	640	76.72	15....	1	509.6	81.61
16...	1¼	506	76.81	16....	Sunday	...	....
17...	1¼	361	77.08	17....	1	653	82.61
18...	1¼	356	78.28	18....	1	893	83.00
19...	Sunday	...	....	19....	1	654	82.51
20...	1¼	994	78.75	20....	1	738	82.57
21...	1¼	873	78.62	21....	1	660	82.15
22...	1¼	834	79.13	22....	1	1,117.3	82.29
23...	1¼	969	79.56	23....	Sunday	...	....
24...	1¼	772	78.55	24....	1	385	81.91
25...	1¼	422.4	79.64	25....	1	608	82.03
26...	Sunday	...	....	26....	1	227	82.65
27...	1¼	708	79.10	27....	1	898	83.84
28...	1¼	625	79.36	28....	1	869	84.10
29...	1¼	435	79.46	29....	1	406.8	84.56
30...	1¼	419	79.61	30....	Sunday	...	....
31...	1	688	80.34	31....	1	609	84.66

September, 1908				October, 1908			
Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)	Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)
1...	1	580	84.55	1....	1¾	253	79.50
2...	1	676	83.76	2....	1½	629	80.53
3...	1	714	82.57	3....	1½	470.6	81.20
4...	1	463	83.55	4....	Sunday	...	....
5...	Holiday	...	....	5....	1¼	904	80.56
6...	Sunday	...	....	6....	1	745	80.93
7...	Holiday	...	....	7....	1¼	789	81.33
8...	1	693	83.67	8....	1¼	727	80.68
9...	1	798	83.61	9....	1¼	815	80.64
10...	1¼	1,021	82.95	10....	1¼	232.4	80.75
11...	1¾	725	82.00	11....	Sunday	...	....
12...	1¾	335.4	82.43	12....	1½	581	81.49
13...	Sunday	...	....	13....	1¼	483	81.21
14...	1¾	692	82.48	14....	1½	428	81.54
15...	1¾	781	81.42	15....	1½	423	81.65
16...	1¾	888	80.21	16....	1½	560	81.81
17...	1¾	995	79.00	17....	1½	192.8	81.35
18...	1½	790	79.85	18....	Sunday	...	....
19...	1½	515.4	78.66	19....	1½	313	81.26
20...	Sunday	...	....	20....	1½	523	82.21
21...	1½	1,086	77.68	21....	1½	912	82.82
22...	1¼	1,435	77.07	22....	1¼	727	82.83
23...	1¼	807	78.87	23....	1½	608	82.44
24...	1¼	998	79.59	24....	1½	190.4	82.48
25...	1¼	907	80.19	25....	Sunday	...	....
26...	1¼	351.3	79.25	26....	1¼	342	82.22
27...	Sunday	...	....	27....	1½	518	83.55
28...	1½	448	79.58	28....	1½	522	82.72
29...	1½	420	79.23	29....	1¼	486	83.15
30...	1¾	367	79.93	30....	1½	608	82.92
				31....	1½	287.3	82.53

158 INTEREST RATES AND SPECULATION

November, 1908				December, 1908			
Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)	Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)
1...	Sunday	...	....	1....	1¾	999	87.63
2...	1½	287	82.90	2....	2	1,136	87.67
3...	Holiday	...	....	3....	2¼	885	86.58
4...	1¾	1,367	84.87	4....	2½	1,065	87.26
5...	1¾	1,143	85.81	5....	2½	696	86.68
6...	1¾	1,544	87.28	6....	Sunday	...	....
7...	1¾	955.2	87.77	7....	2½	707	86.38
8...	Sunday	...	....	8....	2¾	661	87.02
9...	1¾	1,641	87.47	9....	2½	1,067	87.42
10...	2	1,638	87.54	10....	2½	945	87.35
11...	1¾	1,640	87.09	11....	2½	1,001	86.61
12...	1¾	1,275	87.62	12....	2½	553.0	86.47
13...	1¾	1,667	88.38	13....	Sunday	...	....
14...	1¾	663.2	88.09	14....	2½	1,041	85.31
15...	Sunday	...	....	15....	2¾	1,020	85.15
16...	2	1,111	87.68	16....	3½	706	85.88
17...	1¾	1,102	87.69	17....	3½	1,002	83.99
18...	1¾	1,144	86.87	18....	3¼	1,048	83.91
19...	1¾	1,051	86.70	19....	3¼	555.6	83.71
20...	1¾	1,281	86.69	20....	Sunday	...	....
21...	1¾	454.7	86.19	21....	3½	1,327	83.46
22...	Sunday	...	....	22....	3½	1,234	84.57
23...	1¾	727	86.17	23....	3½	1,246	85.48
24...	1¾	980	87.61	24....	3½	860	85.68
25...	1¾	962	87.15	25....	Holiday	...	....
26...	Holiday	...	....	26....	3½	...	....
27...	1¾	779	87.11	27....	Sunday	...	....
28...	1¾	471	87.63	28....	3¼	1,029	86.97
29...	Sunday	...	....	29....	3¼	907	86.22
30...	1¾	975	87.30	30....	3¼	829	85.91
				31....	3	565	86.15

January, 1910				February, 1910			
Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)	Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)
1...	Holiday	...	....	1....	2 $\frac{5}{8}$	564	91.33
2...	Sunday	...	....	2....	2 $\frac{3}{4}$	651	90.40
3...	8	948	98.34	3....	2 $\frac{1}{2}$	1,663	87.50
4...	8	1,117	98.30	4....	2 $\frac{3}{4}$	986	87.77
5...	7	1,246	97.06	5....	2 $\frac{1}{4}$	443.1	88.39
6...	6 $\frac{1}{2}$	951	97.62	6....	Sunday	...	....
7...	5 $\frac{3}{4}$	877	97.67	7....	2 $\frac{3}{4}$	1,278	85.35
8...	5 $\frac{3}{4}$	333.1	97.87	8....	2 $\frac{1}{2}$	1,046	85.03
9...	Sunday	...	....	9....	2 $\frac{1}{4}$	906	87.32
10...	5 $\frac{1}{2}$	570	97.10	10....	2 $\frac{3}{4}$	808	87.85
11...	5 $\frac{1}{4}$	806	96.64	11....	2 $\frac{7}{8}$	727	89.07
12...	4 $\frac{7}{8}$	839	95.85	12....	Holiday	...	....
13...	4	1,116	96.16	13....	Sunday	...	....
14...	3 $\frac{1}{2}$	1,268	93.69	14....	2 $\frac{3}{4}$	731	89.65
15...	3 $\frac{1}{2}$	859.4	94.45	15....	2 $\frac{1}{4}$	591	89.23
16...	Sunday	...	....	16....	2 $\frac{3}{4}$	728	90.09
17...	3 $\frac{3}{4}$	1,145	93.75	17....	2 $\frac{3}{4}$	801	90.65
18...	3 $\frac{3}{4}$	1,129	93.92	18....	2 $\frac{3}{4}$	833	90.92
19...	3 $\frac{3}{4}$	1,633	92.35	19....	2 $\frac{3}{4}$	413	91.14
20...	3 $\frac{3}{4}$	1,114	93.29	20....	Sunday	...	....
21...	3 $\frac{3}{4}$	994	94.41	21....	2 $\frac{3}{4}$	511	90.70
22...	3 $\frac{3}{4}$	560.5	94.52	22....	Holiday	...	....
23...	Sunday	...	....	23....	2 $\frac{7}{8}$	392	90.62
24...	3 $\frac{1}{2}$	1,009	93.08	24....	2 $\frac{7}{8}$	433	91.22
25...	3 $\frac{1}{4}$	1,626	90.66	25....	2 $\frac{7}{8}$	540	91.31
26...	3 $\frac{1}{4}$	900	92.69	26....	2 $\frac{7}{8}$	257.1	90.64
27...	2 $\frac{3}{4}$	1,111	91.62	27....	Sunday	...	....
28...	2 $\frac{1}{2}$	813	91.91	28....	2 $\frac{7}{8}$	503	91.34
29...	2 $\frac{1}{2}$	429.1	92.42				
30...	Sunday	...	....		
31...	2 $\frac{1}{2}$	508	91.31				

160 INTEREST RATES AND SPECULATION

March, 1910				April, 1910			
Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)	Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)
1...	2 $\frac{7}{8}$	502	91.77	1....	3	244	89.71
2...	2 $\frac{3}{4}$	814	92.62	2....	3	126.9	89.71
3...	2 $\frac{3}{4}$	718	92.61	3....	Sunday	...	....
4...	2 $\frac{7}{8}$	399	92.83	4....	3	344	89.75
5...	2 $\frac{7}{8}$	188.8	92.98	5....	2 $\frac{7}{8}$	430	90.96
6...	Sunday	...	....	6....	3	463	91.16
7...	2 $\frac{7}{8}$	930	94.35	7....	3	280	90.89
8...	2 $\frac{7}{8}$	900	94.56	8....	3 $\frac{1}{2}$	567	89.53
9...	2 $\frac{7}{8}$	1,079	94.30	9....	3 $\frac{1}{2}$	304.2	89.36
10...	2 $\frac{7}{8}$	737	93.92	10....	Sunday	...	....
11...	2 $\frac{7}{8}$	853	92.63	11....	3 $\frac{1}{2}$	810	91.10
12...	2 $\frac{7}{8}$	224.7	92.78	12....	3 $\frac{1}{4}$	594	90.92
13...	Sunday	...	....	13....	3 $\frac{1}{4}$	856	92.10
14...	2 $\frac{7}{8}$	445	93.10	14....	3 $\frac{1}{4}$	744	92.36
15...	3	663	91.92	15....	3 $\frac{1}{4}$	512	92.04
16...	3	751	91.35	16....	3 $\frac{1}{4}$	257.0	92.62
18...	2 $\frac{7}{8}$	542	92.14	17....	Sunday	...	....
17...	2 $\frac{7}{8}$	586	92.71	18....	3	569	91.67
19...	2 $\frac{7}{8}$	247.8	92.14	19....	2 $\frac{7}{8}$	506	91.78
20...	Sunday	...	....	20....	2 $\frac{3}{4}$	678	90.37
21...	2 $\frac{7}{8}$	422	92.33	21....	2 $\frac{7}{8}$	369	90.52
22...	2 $\frac{7}{8}$	514	92.36	22....	2 $\frac{7}{8}$	612	89.97
23...	2 $\frac{7}{8}$	600	91.30	23....	2 $\frac{7}{8}$	143.4	90.09
24...	2 $\frac{7}{8}$	322	91.31	24....	Sunday	...	....
25...	Holiday	...	....	25....	2 $\frac{7}{8}$	577	88.73
26...	Holiday	...	....	26....	3	699	88.83
27...	Sunday	...	....	27....	2 $\frac{7}{8}$	918	88.18
28...	2 $\frac{7}{8}$	648	89.72	28....	4	1,300	86.29
29...	2 $\frac{7}{8}$	674	90.21	29....	3 $\frac{1}{4}$	760	87.17
30...	3	685	89.47	30....	3 $\frac{1}{4}$	426	86.20
31...	2 $\frac{7}{8}$	545	89.71				

RATES, SHARES SOLD, AND PRICES 161

May, 1910				June, 1910			
Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)	Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)
1...	Sunday	...	....	1....	3¼	1,305	85.69
2...	5½	1,083	85.51	2....	3	773	85.25
3...	4½	792	84.72	3....	2¾	1,493	82.70
4...	4½	792	86.41	4....	2¾	645.1	83.06
5...	4	828	87.32	5....	Sunday	...	....
6...	3¾	727	86.51	6....	2¾	993	82.05
7...	3¾	261	86.72	7....	2½	1,055	84.50
8...	Sunday	...	....	8....	2½	779	84.55
9...	3¾	637	88.03	9....	2½	460	84.89
10...	3¾	628	88.63	10....	2½	530	83.46
11...	3⅞	672	88.73	11....	2½	285	83.39
12...	3¾	484	88.52	12....	Sunday	...	....
13...	3¾	338	88.72	13....	2½	350	83.88
14...	3¾	209.5	89.13	14....	2½	324	84.28
15...	Sunday	...	....	15....	2¾	358	83.84
16...	3¾	352	88.78	16....	2¾	303	84.12
17...	3¾	292	88.62	17....	2¾	177	84.26
18...	4	229	88.26	18....	2¾	158.4	84.43
19...	3¾	222	88.71	19....	Sunday	...	....
20...	3	299	89.34	20....	2¾	340	85.08
21...	3	295.0	89.66	21....	2⅞	313	85.29
22...	Sunday	...	....	22....	2¾	463	86.28
23...	3½	477	88.77	23....	2¾	344	86.01
24...	3¾	251	89.06	24....	2⅞	601	84.93
25...	3¾	663	88.67	25....	2⅞	212.8	85.25
26...	3¾	345	88.14	26....	Sunday	...	....
27...	3⅞	229	87.86	27....	2⅞	781	83.14
28...	Holiday	28....	2⅞	772	83.14
29...	Sunday	29....	2⅞	1,039	81.60
30...	Holiday	30....	3	1,523	81.18
31...	3¾	762	86.32				

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July, 1910				August, 1910			
Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)	Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)
1...	3¼	823	81.64	1....	1½	361	76.14
2...	Holiday	...	....	2....	1½	627	77.69
3...	Sunday	...	....	3....	1½	512	77.14
4...	Holiday	...	....	4....	1½	315	77.04
5...	3	799	80.23	5....	1½	401	77.58
6...	2⅞	916	80.27	6....	1½	107.7	78.19
7...	2½	573	80.66	7....	Sunday	...	....
8...	2⅞	683	80.83	8....	1½	380	78.13
9...	2⅞	323.1	81.19	9....	1½	558	79.30
10...	Sunday	...	....	10....	1¾	461	79.20
11...	2½	498	81.07	11....	1½	315	78.78
12...	2¾	656	80.14	12....	1¾	490	79.65
13...	2⅞	524	80.79	13....	1¾	222.8	80.05
14...	2⅞	480	81.41	14....	Sunday	...	....
15...	2⅞	309	81.29	15....	1½	325	79.77
16...	2⅞	134.1	81.08	16....	1½	542	81.04
17...	Sunday	...	....	17....	1½	622	81.41
18...	2⅞	571	80.89	18....	1½	553	80.85
19...	2½	288	81.22	19....	1¼	481	80.31
20...	2½	305	81.53	20....	1¼	122.2	80.44
21...	2½	534	79.21	21....	Sunday	...	....
22...	2½	739	77.78	22....	1½	422	79.47
23...	2½	387.4	77.16	23....	1¾	326	79.68
24...	Sunday	...	....	24....	1¾	548	78.96
25...	2	834	75.87	25....	1¾	484	78.59
26...	2	1,284	73.62	26....	1¾	336	79.28
27...	2	945	75.81	27....	1¾	100.3	79.19
28...	1¾	923	78.09	28....	Sunday	...	....
29...	1¾	545	77.57	29....	1½	346	79.67
30...	1¾	234.2	76.48	30....	1¾	297	79.59
31...	Sunday	...	....	31....	1¾	160	79.68

September, 1910				October, 1910			
Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)	Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)
1...	1 $\frac{3}{4}$	401	78.58	1....	2 $\frac{3}{4}$	145.0	79.95
2...	1 $\frac{3}{4}$	187	78.68	2....	Sunday	...	....
3...	Holiday	...	....	3....	2 $\frac{3}{4}$	568	80.68
4...	Sunday	...	....	4....	2 $\frac{3}{4}$	434	81.34
5...	Holiday	...	....	5....	2 $\frac{3}{4}$	495	80.76
6...	1 $\frac{3}{4}$	228	78.35	6....	2 $\frac{3}{4}$	336	81.46
7...	1 $\frac{7}{8}$	314	78.43	7....	2 $\frac{3}{4}$	275	81.48
8...	1 $\frac{7}{8}$	258	78.39	8....	2 $\frac{3}{4}$	90.2	81.51
9...	1 $\frac{7}{8}$	165	78.44	9....	Sunday	...	....
10...	1 $\frac{7}{8}$	57.4	78.57	10....	2 $\frac{3}{4}$	197	81.91
11...	Sunday	...	....	11....	2 $\frac{3}{4}$	396	82.38
12...	1 $\frac{7}{8}$	217	79.13	12....	Holiday	...	....
13...	1 $\frac{7}{8}$	440	79.71	13....	3 $\frac{3}{8}$	680	84.06
14...	1 $\frac{7}{8}$	407	79.40	14....	3 $\frac{3}{4}$	974	84.63
15...	2	458	78.38	15....	3 $\frac{3}{4}$	461.5	85.27
16...	1 $\frac{7}{8}$	391	78.55	16....	Sunday	...	....
17...	1 $\frac{7}{8}$	184.5	78.65	17....	3 $\frac{1}{2}$	988	85.63
18...	Sunday	...	....	18....	3	745	86.02
19...	1 $\frac{3}{4}$	243	78.48	19....	3 $\frac{1}{4}$	665	85.11
20...	1 $\frac{7}{8}$	362	78.37	20....	3 $\frac{1}{4}$	885	86.00
21...	1 $\frac{7}{8}$	475	79.17	21....	3 $\frac{1}{4}$	926	85.35
22...	1 $\frac{7}{8}$	357	79.08	22....	3 $\frac{1}{4}$	388.1	85.94
23...	1 $\frac{7}{8}$	376	78.65	23....	Sunday	...	....
24...	1 $\frac{7}{8}$	113.0	78.51	24....	3 $\frac{1}{4}$	629	85.01
25...	Sunday	...	....	25....	3 $\frac{1}{4}$	584	84.61
26...	2	477	79.19	26....	3 $\frac{5}{8}$	679	84.59
27...	2	491	79.01	27....	3 $\frac{1}{2}$	740	85.51
28...	2 $\frac{1}{4}$	304	78.96	28....	3 $\frac{1}{2}$	455	85.45
29...	2 $\frac{3}{4}$	333	79.07	29....	3 $\frac{1}{2}$	192.7	84.96
30...	2 $\frac{3}{4}$	453	79.72	30....	Sunday
				31....	3 $\frac{1}{2}$	460	84.77

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November, 1910				December, 1910			
Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)	Day	Call Loan Rate (per cent)	Shares Sold (thousands)	Stock Prices (averages)
1...	3¾	279	85.10	1....	2¾	881	81.43
2...	3¾	291	85.45	2....	2½	894	80.60
3...	4	504	85.85	3....	2½	266.3	80.77
4...	4¼	666	85.64	4....	Sunday	...	....
5...	4¼	273.2	85.82	5....	2½	359	81.00
6...	Sunday	...	....	6....	2½	724	79.68
7...	4½	405	85.70	7....	3¼	782	80.46
8...	Holiday	...	....	8....	3¼	769	80.50
9...	4¼	829	84.29	9....	3¼	638	81.00
10...	4	1,158	83.50	10....	3¼	263.1	81.54
11...	3¾	447	83.53	11....	Sunday	...	....
12...	3¾	163.7	83.55	12....	3¾	446	80.96
13...	Sunday	...	....	13....	3½	356	80.77
14...	3½	485	84.40	14....	3¾	248	81.47
15...	3¼	460	84.88	15....	3¾	286	81.28
16...	3¼	489	85.21	16....	3½	311	81.20
17...	3	456	84.57	17....	3½	116.0	81.43
18...	2¾	377	85.12	18....	Sunday	...	....
19...	2¾	191.0	85.40	19....	3¾	422	82.16
20...	Sunday	...	....	20....	3¼	355	81.80
21...	2¾	308	84.90	21....	3¾	321	81.94
22...	2¾	337	84.84	22....	3¼	223	81.42
23...	2½	247	85.05	23....	3¼	111	81.33
24...	Holiday	...	....	24....	Holiday	...	....
25...	2½	177	85.32	25....	Sunday	...	....
26...	2½	65.3	85.30	26....	Holiday	...	....
27...	Sunday	...	....	27....	3¾	265	80.45
28...	2¾	808	83.28	28....	3¾	243	80.65
29...	2½	573	83.62	29....	3½	287	81.76
30...	2½	744	82.52	30....	3½	302	81.41
				31....	3½		81.36

APPENDIX F

RATES ON 60-90 DAY PAPER IN NEW YORK, 1871-1924.

For the years 1871-1922 the rates we have used are monthly averages of weekly high and low figures, computed by W. L. Crum for the Harvard Committee on Economic Research and published in the *Review of Economic Statistics*, January, 1923, Vol. V, p. 28. Regarding the nature of the averages, Mr. Crum says: "The items are averages of the weekly high and low rates in each month, each week being allocated to the month in which the majority of its days are situated." For the period 1871-99, he says further, "The quotations are for 'prime paper,' which classification appears to include all prime short-term notes, regardless of specific maturity and number of names. For the period 1890-1922, the rates are for choice double-name 60-90 day commercial paper."

Data for 1922-24 we have computed from weekly ranges published in the *Commercial and Financial Chronicle*.

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SHORT TIME INTEREST RATES.
(Monthly averages; per cent)

Month	1871	1872	1873	1874	1875	1876	1877	1878	1879
January	8.00	9.30	9.40	7.40	5.75	6.45	5.55	5.85	4.30
February ...	6.45	8.20	9.15	6.00	5.20	5.85	4.50	5.35	3.80
March	6.20	8.65	10.10	6.15	5.90	5.40	4.45	5.15	5.05
April	6.70	8.50	10.75	6.30	5.45	5.50	4.45	5.35	5.45
May	5.40	7.25	8.20	5.60	4.55	5.10	4.00	4.45	4.45
June	4.85	6.00	6.80	5.65	4.55	4.75	4.05	3.80	4.25
July	4.70	6.40	6.50	5.90	4.30	3.80	4.25	3.60	3.90
August	5.20	7.55	7.20	5.45	5.00	3.60	5.70	3.80	5.55
September ...	6.35	10.00	12.50	6.25	5.95	4.75	6.40	4.60	5.80
October	9.40	11.10	17.00	5.80	6.35	5.65	7.25	5.45	5.90
November ...	9.00	12.35	13.85	5.60	6.45	5.50	6.30	5.15	6.25
December ...	9.80	10.90	10.15	6.00	6.65	5.85	5.60	5.05	5.95

Month	1880	1881	1882	1883	1884	1885	1886	1887	1888
January	5.40	5.25	5.60	5.50	4.95	4.69	4.31	5.50	5.55
February ...	5.25	5.38	5.62	5.38	4.75	4.50	3.91	4.81	4.81
March	5.50	5.55	5.62	6.38	4.62	4.45	3.88	5.35	5.22
April	5.50	5.19	5.06	5.81	4.72	3.94	4.25	5.38	5.41
May	5.20	4.00	4.85	5.35	5.06	3.69	4.06	5.20	4.82
June	4.55	3.50	5.19	4.75	5.75	3.55	3.85	5.12	4.25
July	4.45	4.00	4.62	4.80	5.95	3.50	3.94	6.19	4.10
August	5.05	4.95	5.65	5.69	5.50	3.69	5.25	6.35	4.38
September ...	5.25	5.69	6.75	6.00	5.50	3.75	5.81	6.94	5.28
October	5.10	6.25	6.65	6.00	5.50	4.00	6.06	6.38	5.08
November ...	5.50	6.25	6.50	5.69	5.19	4.44	5.90	5.80	4.75
December ...	6.00	6.25	5.88	5.50	5.00	4.50	6.00	6.00	4.97

Month	1889	1890	1891	1892	1893	1894	1895	1896	1897
January	4.65	5.15	5.69	4.16	5.09	3.50	3.10	6.00	3.32
February ...	4.25	5.03	5.00	3.69	4.97	3.25	3.62	5.81	3.00
March	4.50	5.50	5.25	3.98	6.80	3.00	3.91	5.22	3.35
April	4.25	5.10	5.08	3.47	5.75	3.09	3.97	5.28	3.53
May	3.84	5.06	5.38	3.16	6.65	2.92	2.78	4.53	3.53
June	3.88	5.00	5.50	2.96	8.75	2.91	2.63	4.25	3.12
July	4.40	5.05	5.60	3.47	9.75	3.00	2.95	5.05	3.44
August	5.16	5.59	5.75	4.00	9.70	3.08	3.53	7.81	3.72
September ...	5.28	5.75	5.80	4.75	8.28	3.28	4.03	8.35	4.10
October	6.00	5.90	5.53	5.16	5.91	2.75	4.78	8.56	4.19
November ...	6.00	7.50	5.06	5.12	4.38	2.81	4.12	5.34	3.38
December ...	6.09	7.30	4.82	5.62	3.66	2.88	4.75	3.72	3.42

SHORT TIME INTEREST RATES (Continued).
(Monthly averages; per cent)

Month	1898	1899	1900	1901	1902	1903	1904	1905	1906
January	3.25	2.90	4.92	4.03	4.44	5.12	4.91	3.95	5.05
February	3.13	3.12	4.41	3.69	4.00	4.84	4.78	3.84	5.03
March	4.65	3.91	4.88	3.75	4.34	5.53	4.68	3.93	5.28
April	5.75	3.69	4.25	3.98	4.48	5.19	4.06	3.97	5.44
May	4.52	3.60	3.50	3.97	4.53	4.75	3.93	3.98	5.33
June	3.22	3.31	3.69	3.94	4.44	5.10	3.56	3.75	5.25
July	3.66	3.66	4.05	4.30	4.62	5.47	3.53	4.13	5.48
August	3.68	4.35	4.19	4.50	4.84	5.94	3.88	4.20	6.00
September ...	4.12	4.94	4.34	4.94	5.65	6.00	4.31	4.72	6.56
October	3.41	5.20	5.05	4.65	5.94	5.84	4.41	4.95	6.30
November ...	3.30	5.44	4.41	4.72	5.75	5.97	4.12	5.66	6.25
December ...	3.03	5.88	4.75	4.95	6.00	5.85	4.28	5.81	6.25

Month	1907	1908	1909	1910	1911	1912	1913	1914	1915
January	6.15	6.28	3.72	4.75	3.98	3.90	4.66	4.53	3.84
February	5.94	5.06	3.53	4.44	4.09	3.75	4.91	3.84	3.75
March	6.19	5.63	3.50	4.50	3.88	4.19	5.75	3.82	3.38
April	5.92	4.38	3.50	4.75	3.66	4.15	5.53	3.75	3.66
May	5.44	3.94	3.44	4.75	3.63	4.19	5.34	3.88	3.72
June	5.44	3.65	3.25	4.81	3.69	4.00	5.88	3.88	3.65
July	5.75	3.75	3.38	5.38	3.78	4.53	6.06	4.50	3.25
August	6.25	3.59	4.02	5.43	4.19	5.00	6.00	6.34	3.53
September ...	6.81	3.92	4.22	5.53	4.53	5.56	5.78	6.70	3.25
October	7.06	4.06	5.03	5.56	4.35	5.92	5.69	6.44	3.22
November ...	7.50	4.03	5.08	5.50	3.91	5.72	5.56	5.50	2.98
December ...	8.00	3.85	5.09	4.66	4.63	6.00	5.68	4.35	3.13

Month	1916	1917	1918	1919	1920	1921	1922	1923	1924
January	3.13	3.55	5.58	5.19	6.00	7.81	4.90	4.62	4.88
February	3.13	4.09	5.69	5.19	6.41	7.75	4.88	4.66	4.78
March	3.13	4.13	5.88	5.38	6.68	7.62	4.78	5.03	4.63
April	3.13	4.28	5.90	5.38	6.81	7.56	4.56	5.13	4.63
May	3.13	4.83	5.88	5.38	7.16	6.92	4.28	5.13	4.13
June	3.63	5.00	5.88	5.53	7.72	6.69	4.03	4.91	3.97
July	3.97	4.68	5.88	5.42	7.84	6.28	3.94	4.95	3.53
August	3.73	4.81	5.94	5.38	8.00	5.95	3.88	5.03	2.56
September ...	3.38	5.19	6.00	5.38	7.97	5.91	4.19	5.13	2.78
October	3.38	5.38	6.00	5.38	8.00	5.62	4.40	5.13	2.70
November ...	3.50	5.44	5.97	5.50	7.92	5.18	4.62	5.09	3.09
December ...	3.91	5.50	5.78	5.88	7.88	5.12	4.62	4.88	3.45

APPENDIX G

INDEXES OF STOCK PRICES, 1919-24

THE following indexes have been compiled by The Institute of Economics with a view to ascertaining the difference in market behavior of highly speculative securities, moderately speculative common stocks, and high grade preferred stocks.

In Group I it was planned to include no dividend-payers. In order to obtain a sufficient number of suitable quotations, however, it was necessary to make three exceptions. We have included the common stock of the American Linseed Company, on which 75 cents was paid in dividends for each quarter from December 15, 1919, to March 15, 1921; International Nickel common, which paid 2 per cent in 1919; and Pierce-Arrow Motor Car common, which paid 2½ per cent in 1919.

In Group II, one adjustment was necessary. The Consolidated Gas Company of New York declared a 100 per cent stock dividend in December, 1922. The new stock, when issued, sold for approximately one-half the price of the old. The prices of the new stock were therefore multiplied by two in order that the quotations might be made comparable.

In each case the index number is an average of relatives, computed from the monthly high and low prices published in the *Commercial and Financial Chronicle*.

List of Securities Included in Indexes

Group I. Highly Speculative Stocks (common stocks except in one instance, as indicated).

Advance-Rumely Company.
American Hide and Leather Company.
American Linseed Company.
American Writing Paper Company (pfd.).
Butterick Company (The).
Cuba Cane Sugar Corporation.
International Nickel Company (The).
International Paper Company.
Loose-Wiles Biscuit Company.
Pierce-Arrow Motor Car Company (The).

Group II. Dividend Paying Common Stocks.

Allis-Chalmers Manufacturing Company.
American Telephone and Telegraph Company.
Consolidated Gas Company of New York.
National Lead Company.
Philadelphia Company (Pittsburgh).
Pullman Company (The).
United States Steel Corporation.
Western Union Telegraph Company (The).
Westinghouse Electric and Manufacturing Company.
White Motor Company (The).

Group III. Non-Speculative Preferred Stocks.

American Car and Foundry Company.
American Locomotive Company.
American Tobacco Company (The).
American Woolen Company.

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International Harvester Company.
 Liggett and Myers Tobacco Company.
 National Biscuit Company.
 National Lead Company.
 Studebaker Corporation (The).
 United States Steel Corporation.

INDEX NUMBERS.

(Base, in each case: average price 1919-23 = 100.)

GROUP I.

Highly Speculative Stocks.

Month	1919	1920	1921	1922	1923	1924
January	103.11	170.82	87.95	74.26	77.17	64.72
February	103.75	146.50	89.80	77.44	80.46	64.09
March	111.87	152.98	86.34	82.44	84.08	58.52
April	126.69	154.01	88.32	90.10	76.68	54.72
May	142.61	132.05	88.63	90.82	66.65	53.25
June	159.24	132.98	73.65	88.01	59.03	58.14
July	177.02	133.37	70.79	82.62	52.66	66.18
August	157.61	117.63	65.66	85.61	55.46	69.31
September	161.70	118.27	66.95	90.66	55.65	67.96
October	181.05	112.19	66.24	84.43	50.15	65.43
November	173.97	93.87	71.45	74.86	54.34	73.75
December	165.98	74.03	74.82	74.25	58.39	82.82

GROUP II.

Dividend Paying Common Stocks.

Month	1919	1920	1921	1922	1923	1924
January	88.60	102.89	85.25	93.60	116.89	120.39
February	90.83	95.69	86.23	97.37	120.21	120.79
March	93.93	99.10	87.06	101.82	122.10	117.29
April	97.28	99.11	88.45	107.15	120.13	114.18
May	103.14	91.59	88.78	109.23	112.23	115.30
June	102.81	91.91	82.47	107.97	108.92	117.29
July	107.78	90.49	81.36	109.90	107.15	124.52
August	99.92	86.85	79.94	115.98	110.53	131.40
September	100.66	89.91	82.38	119.30	111.24	130.49
October	106.42	90.76	84.64	116.84	108.95	128.33
November	102.52	86.39	89.43	112.50	112.13	133.82
December	99.70	81.08	92.31	113.63	115.57	141.69

GROUP III.

Non-Speculative Preferred Stocks.

Month	1919	1920	1921	1922	1923	1924
January	98.80	99.94	94.04	101.04	106.95	104.60
February	98.93	98.52	95.31	101.96	107.21	104.55
March	99.80	98.21	95.15	103.05	106.13	104.47
April	100.03	97.16	95.18	103.32	104.61	103.77
May	100.94	93.86	94.23	104.15	104.21	104.34
June	102.24	92.59	92.39	105.30	103.66	104.92
July	102.67	92.35	93.53	106.54	104.19	105.96
August	101.26	91.91	92.89	106.86	104.83	106.37
September	101.21	92.47	94.23	108.00	103.80	105.48
October	101.08	92.74	95.04	108.00	103.67	104.89
November	100.28	91.88	97.59	108.55	104.58	105.50
December	99.40	90.51	99.02	107.23	104.34	106.51

APPENDIX H

INTEREST RATES AND THE PRICE OF NON-SPECULATIVE SECURITIES.

THROUGHOUT our discussion we have confined attention to the relation of changes in call loan and short time rates to changes in the prices of *speculative* securities. We have laid great emphasis on the uncertainty of dividends and the consequent instability of prices of speculative securities, pointing out that the risk of loss and the chance of profit which results from this instability make the interest rate a minor factor in the decision as to when to buy and when to sell. We have left open the closely related question of the relation of the money market to the prices of high grade investments. If we should confine our analysis to securities in which there is little or no uncertainty concerning the dividend or interest yield, would not short time rates then appear as the principal cause of the changes in the level of prices?

Various studies of the bond market have pointed to the conclusion that the prices of high grade securities are controlled by money market movements,¹ and our analysis of the behavior of our selected group of high grade preferred stocks during the period from 1919 to 1924 gives a certain measure of support to this view. There is little doubt that high grade investment stocks and bonds do tend to rise either at the time when interest rates decline or within a few months thereafter, and vice versa.

¹ *Review of Economic Statistics*, July, 1923, Vol. V, pp. 212-7; *Cleveland Trust Company Business Bulletin*, April 15, 1924.

Whether this means that changes in interest rates cause corresponding movements in the prices of preferred stocks and bonds cannot be definitely stated without more extensive study. The usual explanation of the phenomenon is that the spread between interest rates and security yields encourages purchases on borrowed money, and that banks and money lenders prefer to purchase securities rather than to lend out their funds at unattractive rates. Such an explanation is much more plausible as applied to the investment market than it is with regard to the speculative security market, but even here the importance of the point is an open question. It seems to us at least as reasonable to believe that the declining interest rate for short time money and the advancing prices of bonds and high grade preferred stocks are both effects of a common cause; namely, the release of funds from employment as working capital during periods of slack business activity and their reabsorption during up-swings of business. Do banks buy bonds primarily because the rate of interest they can collect from borrowers is low, or because they do not have a sufficient demand for good commercial loans at *any* rate of interest? Do business houses which invest their funds in bonds during slack seasons resell the bonds in time of quickening activity because they must pay a little more for credit at the bank, or because their increased demands for working capital make it desirable for them to liquidate the assets not directly used in the business rather than to exhaust their lines of credit? A thorough investigation of this phase of the problem would take us far beyond the field of the present study.

APPENDIX I

NOTE ON STATISTICAL METHODS

IN the course of this investigation, the authors have encountered one problem of method, the solution of which seems to call for fuller explanation than has been given in the text. This is the question whether the data used in the statistical operations of the work should be "adjusted" for seasonal variation and secular trend.

There is no question that interest rates display a seasonal variation and that the indexes of stock prices have distinct secular trends. Modern statistical economics properly emphasizes the necessity of taking account of such characteristics of the data used. For certain purposes adjustments which substantially eliminate such variations are absolutely essential. There is, however, serious question whether these variations should be eliminated in this particular case.

So far as the secular trend of stock prices is concerned, the point is of no practical importance except in Chapter VIII, where it is obviously necessary to adjust for trend before computing the correlation coefficients. In Chapters IV to VII the argument depends, so far as the stock prices are concerned, on the dates when major upward and downward swings began. We have checked the data used against data adjusted for trend, and find that the two sets of data show identical turning points, except in

a few cases where the unadjusted data showed no change for two or more months at the top or bottom of the swing. In these cases we have taken the last item as the turning point; in two or three cases the adjusted data show the first item as the maximum or minimum sought for.

The question whether adjustment should be made for the seasonal movement of interest rates is more important. Our method consists in a comparison of the lengths of different periods of low rates or declining rates and periods of high rates or advancing rates with the accompanying behavior of the stock market. The lengths of these periods would be materially affected in a number of cases by adjustment for seasonal variation. Whether adjustment is called for depends on the exact meaning of the theory to be tested.

The doctrine we are reviewing is based on the assumption that when interest rates are low speculators are more ready to buy stocks, and when they are high they are likely to sell them. The writers who support this doctrine have in few or no cases made it clear whether they believe that speculators are governed primarily by their opinion that rates are absolutely high or low, or by a judgment as to whether they are high or low in comparison with their usual seasonal position. If it is believed that a low rate coming at a season when rates are normally low encourages stock speculation, the point should be tested by the use of unadjusted data; if it is believed that typically speculators discount the seasonal variation and are induced to buy only by rates which are low for a given season, then the point should be tested by the use of adjusted data. As the authors

are convinced that neither of these things is logically to be expected, they are under some difficulty in framing an assumption as to which point of view should be read into the theory. The difficulty is increased by the fact that some of the writers whose views are criticized habitually use adjusted data in their own investigations while others vigorously repudiate such procedure. A complete analysis of the data would require that detailed study be made with both adjusted and unadjusted data; and possibly with data adjusted by several different methods. The labor involved in this procedure, however, would be greater than the interest of the results seems to justify.

The solution we have reached is to use unadjusted data in Chapters IV to VI and in Chapter IX, where we are examining the orthodox theory as set forth by the writers who have as a rule used unadjusted data in their own studies; and to use adjusted data in Chapter VII which is directed specifically at conclusions reached as a result of investigations in which modern statistical methods have been employed. In Chapter VIII, where correlation methods are used, it is necessary to reduce the data to deviations from trend, in order to avoid a correlation due to similarity or dissimilarity of the trends themselves. Seasonal fluctuations have not been taken account of here, as we have shown in Chapter II that seasonal fluctuations in interest rates are not reflected in the stock prices.

The theory of the significance of the form of the correlation graphs developed in Chapter VIII was checked by comparison with the results obtained by correlating theoretical functional series having periodic and secular components. The analysis was similar to that

followed by Rietz in the paper referred to in Chapter VIII,¹ and need not be detailed.

The "probable errors" of the correlation coefficients are not considered for the reason that they do not have their usual significance in the present case. In correlation theory the probable error is a measure of the reliability and, in fact, of the significance of the correlation coefficients from the point of view of abstract probability. In the present case, as was noted in Chapter VIII, the reliability and the significance of our correlation coefficients is measured by the unique conformation of the graph which portrays them. As may be seen in the chart on p. 92, the correlation coefficients are an unmistakably definite function of the lag; and it is evident that the values of the coefficients for different lags are determined by the time relationship of the fluctuations in the two series that are being correlated, exactly as in the case of the functional forms studied by Rietz, which actually had perfect correlation but had a zero coefficient.

¹"Functional Relations for which the Coefficient of Correlation is Zero," *Quarterly Publications of the American Statistical Association*, September, 1919, Vol. XVI, p. 472.

APPENDIX J

SECULAR TRENDS OF SHORT TIME INTEREST RATES AND STOCK PRICES

THE general conformation of the unadjusted data for short-time interest rates and stock prices, as shown in the chart opposite p. 53, makes it evident that it is desirable in each case to treat separately the data for the periods 1871-97 and 1898-1922. It is evident that the series for each of these periods has much more "economic homogeneity" than could possibly be ascribed to either of the series for the entire period. Least square straight lines were therefore fitted to the two series for each of these two periods.

In fitting the lines, use was made of quarter-yearly averages of the original monthly data. It is a common practice to fit straight line trends to yearly items, using yearly averages of monthly items when such data are available, but it was found practicable in this study to use quarter-yearly averages. The first moments were computed by the method of inverse differences developed in recent years which is much less laborious than the direct multiplications currently used and affords an automatic check. The method of inverse differences is worked out in detail in Whittaker and Robinson, *Calculation of Observations*, 1924, p. 192; Czuber, *Statistische Forschungsmethoden*, 1923, p. 63. The statistical constants associated with the trend are as follows:

STATISTICAL CONSTANTS ASSOCIATED WITH THE STRAIGHT LINE
TREND OF QUARTERLY AVERAGE INTEREST RATES AND
STOCK PRICES, 1871-1922.

Rates on 60-90 Day Paper

	1874-1897	1898-1922
n	96	100
a	5.043	4.854
b	- 0.0101	+ 0.0122
d	0.767	0.857
S.D.	1.027	1.049
d%	15.541	17.528
S.D.%	21.243	21.216

Industrial Stock Prices

	1872-1897	1898-1922
n	104	99
a	52.471	87.061
b	+ 0.0214	+ 0.681
d	6.087	10.988
S.D.	7.507	13.758
d%	11.314	12.529
S.D.%	14.304	15.516

n = the number of items used in fitting the line.

a = the average (arithmetic mean) of the series.

b = the slope of the trend; numerically the quarterly trend increment.

d = the average deviation, plus or minus, from trend.

S.D. = the "standard deviation"; the square root of the average deviation squared.

d% = average (arithmetic mean) percentage deviation from trend.

S.D.% = standard deviation of percentage deviations.

After fitting the line of trend to the data, the deviations of the original items from the trend were computed, and reduced to percentages of the corresponding ordinates of trend. The quarter-yearly items, the corresponding trend line items, and the percentage differences between the two are given in the accompanying tables. Graphic representation of the quarterly data and the trends is given in the charts on pages 185 and 186.

RATES ON PRIME PAPER.

1871-1880.

Year	Quarterly Average	Trend Values	Deviations from Trend	Percentage Deviations
1871.....	6.88	5.65	+ 1.23	...
	5.65	5.64	+ 0.01	...
	5.42	5.63	- 0.21	...
	9.40	5.61	+ 3.79	...
1872.....	8.72	5.60	+ 3.12	...
	7.25	5.59	+ 1.66	...
	7.98	5.58	+ 2.40	...
	11.45	5.57	+ 5.88	...
1873.....	9.55	5.56	+ 3.99	...
	8.58	5.55	+ 3.03	...
	8.73	5.54	+ 3.19	...
	13.67	5.53	+ 8.14	...
1874.....	6.52	5.52	+ 1.00	+ 18.1
	5.85	5.51	+ 0.34	+ 6.2
	5.87	5.50	+ 0.37	+ 6.7
	5.80	5.49	+ 0.31	+ 5.6
1875.....	5.62	5.48	+ 0.14	+ 2.6
	4.85	5.47	- 0.62	- 11.3
	5.08	5.46	- 0.38	- 6.9
	6.48	5.45	+ 1.03	+ 18.9
1876.....	5.90	5.44	+ 0.46	+ 8.4
	5.12	5.43	- 0.31	- 5.7
	4.05	5.42	- 1.37	- 25.3
	5.67	5.41	+ 0.26	+ 4.8
1877.....	4.83	5.40	- 0.57	- 10.5
	4.17	5.39	- 1.22	- 22.6
	5.45	5.38	+ 0.07	+ 1.3
	6.38	5.37	+ 1.01	+ 18.8
1878.....	5.45	5.36	+ 0.09	+ 1.7
	4.53	5.35	- 0.82	- 15.3
	4.00	5.34	- 1.34	- 25.1
	5.22	5.33	- 0.11	- 2.1
1879.....	4.38	5.32	- 0.94	- 17.7
	4.72	5.31	- 0.59	- 11.1
	5.08	5.30	- 0.22	- 4.1
	6.03	5.29	+ 0.74	+ 14.0
1880.....	5.38	5.28	+ 0.10	+ 1.9
	5.08	5.27	- 0.19	- 3.6
	4.92	5.26	- 0.34	- 6.5
	5.53	5.25	+ 0.28	+ 5.3

1881-1891.

Year	Quarterly Average	Trend Values	Deviations from Trend	Percentage Deviations
1881.....	5.39	5.24	+ 0.15	+ 2.8
	4.23	5.23	- 1.00	- 19.1
	4.88	5.22	- 0.34	- 6.5
	6.25	5.21	+ 1.04	+ 19.9
1882.....	5.61	5.20	+ 0.41	+ 7.9
	5.03	5.19	- 0.16	- 3.1
	5.67	5.18	+ 0.49	+ 9.5
	6.34	5.17	+ 1.17	+ 22.6
1883.....	5.75	5.16	+ 0.59	+ 11.4
	5.30	5.15	+ 0.15	+ 2.9
	5.50	5.14	+ 0.36	+ 7.0
	5.73	5.13	+ 0.60	+ 11.7
1884.....	4.77	5.12	- 0.35	- 6.8
	5.18	5.11	+ 0.07	+ 1.4
	5.65	5.10	+ 0.55	+ 10.8
	5.23	5.09	+ 0.14	+ 2.8
1885.....	4.55	5.08	- 0.53	- 10.4
	3.73	5.07	- 1.34	- 26.4
	3.65	5.06	- 1.41	- 27.9
	4.31	5.05	- 0.74	- 14.7
1886.....	4.03	5.04	- 1.01	- 20.0
	4.05	5.03	+ 0.98	- 19.5
	5.00	5.02	+ 0.02	- 0.4
	5.99	5.01	+ 0.98	+ 19.6
1887.....	5.22	5.00	+ 0.22	+ 4.4
	5.23	4.99	+ 0.24	+ 4.8
	6.49	4.98	+ 1.51	+ 30.3
	6.06	4.97	+ 1.09	+ 21.9
1888.....	5.19	4.96	+ 0.23	+ 4.6
	4.83	4.95	- 0.12	- 2.4
	4.59	4.94	- 0.35	- 7.1
	4.93	4.93	- 0.00	- 0.0
1889.....	4.47	4.92	- 0.45	- 9.1
	3.99	4.91	- 0.92	- 18.7
	4.95	4.90	+ 0.05	+ 1.0
	6.03	4.89	+ 1.14	+ 23.3
1890.....	5.23	4.88	+ 0.35	+ 7.2
	5.05	4.87	+ 0.18	+ 3.7
	5.46	4.86	+ 0.60	+ 12.4
	6.90	4.85	+ 2.05	+ 42.3
1891.....	5.31	4.84	+ 0.47	+ 9.7
	5.32	4.83	+ 0.49	+ 10.1
	5.72	4.82	+ 0.90	+ 18.7
	5.14	4.81	+ 0.33	+ 6.9

1892-1902.

Year	Quarterly Average	Trend Values	Deviations from Trend	Percentage Deviations
1892.....	3.94	4.80	- 0.86	- 17.9
	3.20	4.79	- 1.59	- 33.2
	4.07	4.78	- 0.71	- 14.9
	5.30	4.77	+ 0.53	+ 11.1
1893.....	5.62	4.76	+ 0.86	+ 18.1
	7.05	4.74	+ 2.31	+ 48.8
	9.24	4.73	+ 4.51	+ 95.3
	4.65	4.72	- 0.07	- 1.5
1894.....	3.25	4.71	- 1.46	- 31.0
	2.97	4.70	- 1.73	- 36.8
	3.12	4.69	- 1.57	- 33.5
	2.81	4.68	- 1.87	- 40.0
1895.....	3.54	4.67	- 1.13	- 24.2
	3.13	4.66	- 1.53	- 32.8
	3.50	4.65	- 1.15	- 24.7
	4.55	4.64	- 0.09	- 1.9
1896.....	5.68	4.63	+ 1.05	+ 22.7
	4.69	4.62	+ 0.07	+ 1.5
	7.07	4.61	+ 2.46	+ 53.3
	6.87	4.60	+ 2.27	+ 49.4
1897.....	3.22	4.59	- 1.37	- 29.8
	3.39	4.58	- 1.19	- 26.0
	3.75	4.57	- 0.82	- 18.0
	3.66	4.56	- 0.90	- 19.7
1898.....	3.68	4.25	- 0.57	- 13.4
	4.50	4.26	+ 0.24	+ 5.6
	3.82	4.28	- 0.46	- 10.7
	3.25	4.29	- 1.04	- 24.2
1899.....	3.31	4.30	- 0.99	- 23.0
	3.53	4.31	- 0.78	- 18.1
	4.32	4.33	- 0.01	- 0.2
	5.51	4.34	+ 1.17	+ 27.0
1900.....	4.74	4.35	+ 0.39	+ 9.0
	3.81	4.36	- 0.55	- 12.6
	4.19	4.37	- 0.18	- 4.1
	4.74	4.39	+ 0.35	+ 8.0
1901.....	3.82	4.40	- 0.58	- 13.2
	3.96	4.41	- 0.45	- 10.2
	4.58	4.42	+ 0.16	+ 3.6
	4.77	4.43	+ 0.34	+ 7.7
1902.....	4.26	4.45	- 0.19	- 4.3
	4.38	4.46	- 0.08	- 1.8
	5.04	4.47	+ 0.57	+ 12.8
	5.90	4.48	+ 1.42	+ 31.7

1903-1913.

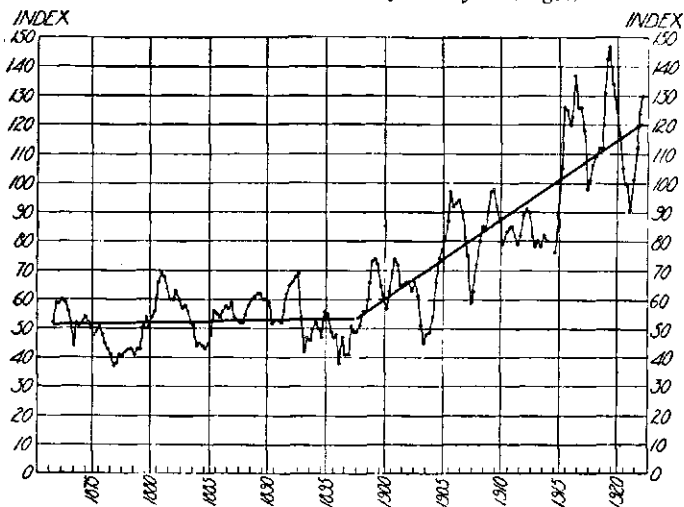
Year	Quarterly Average	Trend Values	Deviations from Trend	Percentage Deviations
1903.....	5.16	4.50	+ 0.66	+ 14.7
	5.01	4.51	+ 0.50	+ 11.1
	5.80	4.52	+ 1.28	+ 28.3
	5.89	4.53	+ 1.36	+ 30.0
1904.....	4.79	4.54	+ 0.25	+ 5.5
	3.85	4.56	- 0.71	- 15.6
	3.91	4.57	- 0.66	- 14.4
	4.27	4.58	- 0.31	- 6.8
1905.....	3.91	4.59	- 0.68	- 14.8
	3.90	4.60	- 0.70	- 15.2
	4.35	4.62	- 0.27	- 5.8
	5.47	4.63	+ 0.84	+ 18.1
1906.....	5.12	4.64	+ 0.48	+ 10.3
	5.34	4.65	+ 0.69	+ 14.8
	6.01	4.67	+ 1.34	+ 28.7
	6.27	4.68	+ 1.59	+ 34.0
1907.....	6.09	4.69	+ 1.40	+ 29.9
	5.60	4.70	+ 0.90	+ 19.1
	6.27	4.71	+ 1.56	+ 33.1
	7.52	4.73	+ 2.79	+ 59.0
1908.....	5.66	4.74	+ 0.92	+ 19.4
	3.99	4.75	- 0.76	- 16.0
	3.75	4.76	- 1.01	- 21.2
	3.98	4.77	- 0.79	- 16.6
1909.....	3.58	4.79	- 1.21	- 25.3
	3.40	4.80	- 1.40	- 29.2
	3.87	4.81	- 0.94	- 19.5
	5.07	4.82	+ 0.25	+ 5.2
1910.....	4.56	4.84	- 0.28	- 5.8
	4.77	4.85	- 0.08	- 1.6
	5.45	4.86	+ 0.59	+ 12.1
	5.24	4.87	+ 0.37	+ 7.6
1911.....	3.98	4.88	- 0.90	- 18.4
	3.66	4.90	- 1.24	- 25.3
	4.17	4.91	- 0.74	- 15.1
	4.30	4.92	- 0.62	- 12.6
1912.....	3.95	4.93	- 0.98	- 19.9
	4.11	4.94	- 0.83	- 16.8
	5.03	4.96	+ 0.07	+ 1.4
	5.88	4.97	+ 0.91	+ 18.3
1913.....	5.11	4.98	+ 0.13	+ 2.6
	5.58	4.99	+ 0.59	+ 11.8
	5.95	5.01	+ 0.94	+ 18.8
	5.64	5.02	+ 0.62	+ 12.4

1914-1922.

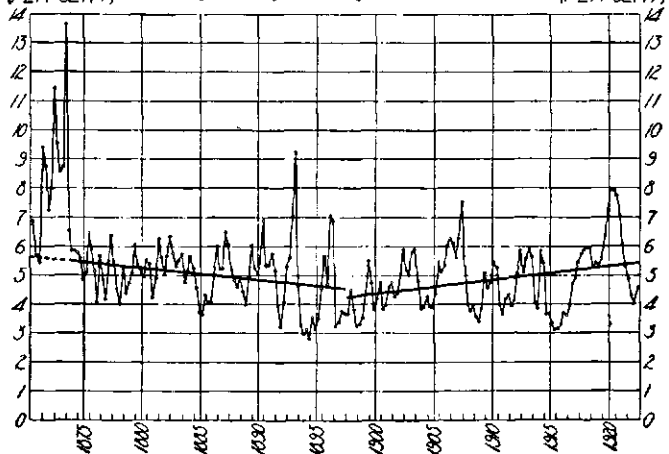
Year	Quarterly Average	Trend Values	Deviations from Trend	Percentage Deviations
1914.....	4.06	5.03	- 0.97	- 19.3
	3.84	5.04	- 1.20	- 23.8
	5.85	5.05	+ 0.80	+ 15.8
	5.43	5.07	+ 0.36	+ 7.1
1915.....	3.66	5.08	- 1.42	- 28.0
	3.68	5.09	- 1.41	- 27.7
	3.34	5.10	- 1.76	- 34.5
	3.11	5.12	- 2.01	- 39.3
1916.....	3.13	5.13	- 2.00	- 39.0
	3.30	5.14	- 1.84	- 35.8
	3.69	5.15	- 1.46	- 28.3
	3.60	5.16	- 1.56	- 30.2
1917.....	3.92	5.18	- 1.26	- 24.3
	4.70	5.19	- 0.49	- 9.4
	4.89	5.20	- 0.31	- 6.0
	5.44	5.21	+ 0.23	+ 4.4
1918.....	5.72	5.22	+ 0.50	+ 9.6
	5.89	5.24	+ 0.65	+ 12.4
	5.94	5.25	+ 0.69	+ 13.1
	5.92	5.26	+ 0.66	+ 12.5
1919.....	5.25	5.27	- 0.02	- 0.4
	5.43	5.29	+ 0.14	+ 2.6
	5.39	5.30	+ 0.09	+ 1.7
	5.59	5.31	+ 0.28	+ 5.3
1920.....	6.36	5.32	+ 1.04	+ 19.5
	7.23	5.33	+ 1.90	+ 35.6
	7.94	5.35	+ 2.59	+ 48.4
	7.93	5.36	+ 2.57	+ 47.9
1921.....	7.73	5.37	+ 2.36	+ 47.7
	7.06	5.38	+ 1.68	+ 31.2
	6.05	5.39	+ 0.66	+ 12.2
	5.31	5.41	- 0.10	- 1.8
1922.....	4.85	5.42	- 0.57	- 10.5
	4.29	5.43	- 1.14	- 21.0
	4.00	5.44	- 1.44	- 26.5
	4.55	5.46	- 0.91	- 16.7

TRENDS OF STOCK PRICES AND SHORT TIME INTEREST RATES.
 (Computed by method of last squares from data for quarterly averages.)

I. Index of Industrial Stock Prices (Quarterly Averages) 1872-1922



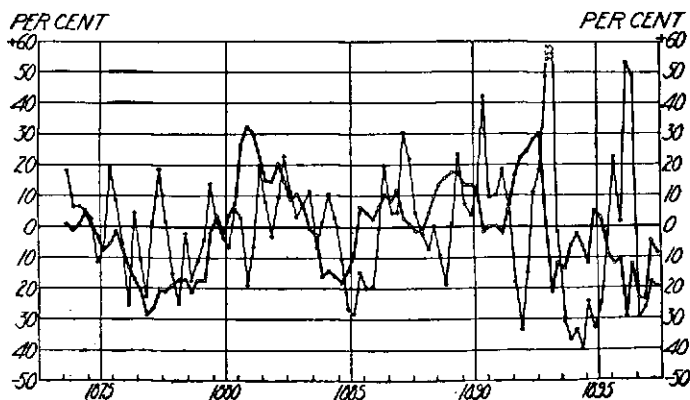
II. Rates on Prime 60-90 Day Paper (Quarterly Averages) 1871-1922.



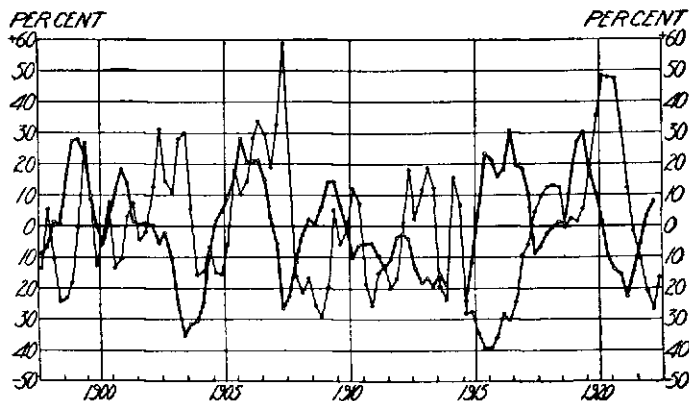
PERCENTAGE DEVIATIONS FROM TREND OF INDUSTRIAL STOCK PRICES
AND SHORT-TIME INTEREST RATES.

I. 1874-1897.

— Stock Prices — Interest Rates



II. 1898-1922.



INDUSTRIAL STOCK PRICES.

1872-1881.

Year	Quarterly Average	Trend Values	Deviations from Trend	Percentage Deviations
1872.....	52	51.37	+ 0.63	...
	59	51.39	+ 7.61	...
	59	51.41	+ 7.59	...
1873.....	60	51.43	+ 8.57	...
	59	51.46	+ 7.54	...
	56	51.48	+ 4.52	...
	52	51.50	+ 0.50	...
1874.....	44	51.52	- 7.52	...
	52	51.54	+ 0.46	+ 0.9
	51	51.56	- 0.56	- 1.1
	52	51.58	+ 0.42	+ 0.8
1875.....	54	51.61	+ 2.39	+ 4.7
	52	51.63	+ 0.37	+ 0.7
	50	51.65	- 1.65	- 3.2
	48	51.67	- 3.67	- 7.1
1876.....	49	51.69	- 2.69	- 5.2
	51	51.71	- 0.71	- 1.4
	48	51.73	- 3.73	- 7.2
	45	51.75	- 6.75	- 13.0
1877.....	43	51.78	- 8.78	- 17.0
	41	51.80	- 10.80	- 20.8
	37	51.82	- 14.82	- 28.6
	38	51.84	- 13.84	- 26.7
1878.....	41	51.86	- 10.86	- 20.9
	41	51.88	- 10.88	- 21.0
	42	51.90	- 9.90	- 19.1
	43	51.93	- 8.93	- 17.2
1879.....	43	51.95	- 8.95	- 17.2
	41	51.97	- 10.97	- 21.1
	43	51.99	- 8.99	- 17.3
	43	52.01	- 9.01	- 17.3
1880.....	51	52.03	- 1.03	- 2.0
	54	52.05	+ 1.95	+ 3.7
	51	52.08	- 1.08	- 2.1
	54	52.10	+ 1.90	+ 3.6
1881.....	56	52.12	+ 3.88	+ 7.4
	66	52.14	+ 13.86	+ 26.6
	69	52.16	+ 16.84	+ 32.3
	68	52.18	+ 15.82	+ 30.3
	64	52.20	+ 11.80	+ 22.6

1882-1892.

Year	Quarterly Average	Trend Values	Deviations from Trend	Percentage Deviations
1882.....	60	52.23	+ 7.77	+ 14.9
	60	52.25	+ 7.75	+ 14.8
	63	52.27	+ 10.73	+ 20.5
	60	52.29	+ 7.71	+ 14.7
1883.....	57	52.31	+ 4.69	+ 9.0
	58	52.33	+ 5.67	+ 10.8
	56	52.35	+ 3.65	+ 7.0
	52	52.37	- 0.37	- 0.7
1884.....	51	52.40	- 1.40	- 2.7
	44	52.42	- 8.42	- 16.1
	45	52.44	- 7.44	- 14.2
	44	52.46	- 8.46	- 16.1
1885.....	43	52.48	- 9.48	- 18.1
	45	52.50	- 7.50	- 14.3
	48	52.52	- 4.52	- 8.6
	56	52.55	+ 3.45	+ 6.6
1886.....	55	52.57	+ 2.43	+ 4.6
	54	52.59	+ 1.41	+ 2.7
	56	52.61	+ 3.39	+ 6.4
	58	52.63	+ 5.37	+ 10.2
1887.....	57	52.65	+ 4.35	+ 8.3
	59	52.67	+ 6.33	+ 12.0
	54	52.70	+ 1.30	+ 2.5
	53	52.72	+ 0.28	+ 0.5
1888.....	52	52.74	- 0.74	- 1.4
	52	52.76	- 0.76	- 1.4
	55	52.78	+ 2.22	+ 4.2
	58	52.80	+ 5.20	+ 9.8
1889.....	60	52.82	+ 7.18	+ 13.6
	61	52.85	+ 8.15	+ 15.4
	62	52.87	+ 9.13	+ 17.3
	62	52.89	+ 9.11	+ 17.2
1890.....	60	52.91	+ 7.09	+ 13.4
	60	52.93	+ 7.07	+ 13.4
	59	52.95	+ 6.05	+ 11.4
	52	52.97	- 0.97	- 1.8
1891.....	53	53.00	- 0.00	- 0.0
	53	53.02	- 0.02	- 0.0
	52	53.04	- 1.04	- 2.0
	56	53.06	+ 2.94	+ 5.5
1892.....	62	53.08	+ 8.92	+ 16.8
	65	53.10	+ 11.90	+ 22.4
	66	53.12	+ 12.88	+ 24.2
	68	53.14	+ 14.86	+ 28.0

1893-1903.

Year	Quarterly Average	Trend Values	Deviations from Trend	Percentage Deviations
1893.....	69	53.17	+ 15.83	+ 30.0
	54	53.19	+ 0.81	+ 1.5
	42	53.21	- 11.21	- 21.1
	47	53.23	- 6.23	- 11.7
1894.....	46	53.25	- 7.25	- 13.6
	50	53.27	- 3.27	- 6.1
	52	53.29	- 1.29	- 2.4
	50	53.32	- 3.32	- 6.2
1895.....	47	53.34	- 6.34	- 11.9
	56	53.36	+ 2.64	+ 4.9
	55	53.38	+ 1.62	+ 3.0
	49	53.40	- 4.40	- 8.2
1896.....	47	53.42	- 6.42	- 12.0
	48	53.44	- 5.44	- 10.2
	38	53.47	- 15.47	- 28.9
	47	53.49	- 6.49	- 12.1
1897.....	41	53.51	- 12.51	- 23.4
	41	53.53	- 12.53	- 23.4
	51	53.55	- 2.55	- 4.8
	49	53.57	- 4.57	- 8.5
1898.....	49	53.70	- 4.70	- 8.8
	51	54.38	- 3.38	- 6.6
	56	55.06	+ 0.94	+ 1.7
	56	55.74	+ 0.26	+ 0.5
1899.....	66	56.42	+ 9.58	+ 17.0
	73	57.10	+ 15.90	+ 27.8
	74	57.78	+ 16.22	+ 28.1
	72	58.46	+ 13.54	+ 23.2
1900.....	65	59.14	+ 5.86	+ 9.9
	60	59.82	+ 0.18	+ 0.3
	57	60.51	- 3.51	- 5.8
	63	61.19	+ 1.81	+ 3.0
1901.....	69	61.87	+ 7.13	+ 11.5
	74	62.55	+ 11.45	+ 18.3
	72	63.23	+ 8.77	+ 13.9
	65	63.91	+ 1.09	+ 1.7
1902.....	65	64.59	+ 0.41	+ 0.6
	66	65.27	+ 0.73	+ 1.1
	66	65.95	+ 0.05	+ 0.1
	63	66.63	- 3.63	- 5.4
1903.....	66	67.31	- 1.31	- 1.9
	61	68.00	- 7.00	- 10.3
	51	68.68	- 17.68	- 25.7
	45	69.36	- 24.36	- 35.1

1904-1914.

Year	Quarterly Average	Trend Values	Deviations from Trend	Percentage Deviations
1904.....	48	70.04	- 22.04	- 31.5
	49	70.72	- 21.72	- 30.7
	54	71.40	- 17.40	- 24.4
	66	72.08	- 6.08	- 8.4
1905.....	74	72.76	+ 1.24	+ 1.7
	77	73.44	+ 3.56	+ 4.8
	81	74.12	+ 6.88	+ 9.3
	87	74.80	+ 12.20	+ 16.3
1906.....	97	75.49	+ 21.51	+ 28.5
	92	76.17	+ 15.83	+ 20.8
	93	76.85	+ 16.15	+ 21.0
	94	77.53	+ 16.47	+ 21.2
1907.....	90	78.21	+ 11.79	+ 15.1
	81	78.89	+ 2.11	+ 2.7
	75	79.57	- 4.57	- 5.7
	59	80.25	- 21.25	- 26.5
1908.....	63	80.93	- 17.93	- 22.2
	72	81.61	- 9.61	- 11.8
	80	82.29	- 2.29	- 2.8
	85	82.98	+ 2.02	+ 2.4
1909.....	84	83.66	+ 0.34	+ 0.4
	90	84.34	+ 5.66	+ 6.7
	97	85.02	+ 11.98	+ 14.1
	98	85.70	+ 12.30	+ 14.4
1910.....	92	86.38	+ 5.62	+ 6.5
	87	87.06	- 0.06	- 0.1
	79	87.74	- 8.74	- 10.0
	83	88.42	- 5.42	- 6.1
1911.....	84	89.10	- 5.10	- 5.7
	85	89.78	- 4.78	- 5.3
	82	90.47	- 8.47	- 9.4
	79	91.15	- 12.15	- 13.3
1912.....	82	91.83	- 9.83	- 10.7
	89	92.51	- 3.51	- 3.8
	91	93.19	- 2.19	- 2.4
	90	93.87	- 3.87	- 4.1
1913.....	82	94.55	- 12.55	- 13.3
	78	95.23	- 17.23	- 18.1
	80	95.91	- 15.91	- 16.6
	78	96.59	- 18.59	- 19.2
1914.....	82	97.27	- 15.27	- 15.7
	80	97.96	- 17.96	- 18.3
	79	98.64	- 19.64	- 19.9
	77	99.32	- 22.32	- 22.5

1915-1922.

Year	Quarterly Average	Trend Values	Deviations from Trend	Percentage Deviations
1915.....	76	100.00	- 24.00	- 24.0
	89	100.68	- 11.68	- 11.6
	105	101.36	+ 3.64	+ 3.6
	126	102.04	+ 23.96	+ 23.5
1916.....	125	102.72	+ 22.28	+ 21.7
	120	103.40	+ 16.60	+ 16.1
	123	104.08	+ 18.92	+ 18.2
	137	104.76	+ 32.24	+ 30.8
1917.....	126	105.44	+ 20.56	+ 19.5
	126	106.13	+ 19.87	+ 18.7
	118	106.81	+ 11.19	+ 10.5
	98	107.49	- 9.49	- 8.8
1918.....	101	108.17	- 7.17	- 6.6
	106	108.85	- 2.85	- 2.6
	109	109.53	- 0.53	- 0.5
	112	110.21	+ 1.79	+ 1.6
1919.....	112	110.89	+ 1.11	+ 1.0
	131	111.57	+ 19.43	+ 17.4
	143	112.25	+ 30.75	+ 27.4
	147	112.93	+ 34.07	+ 30.2
1920.....	134	113.62	+ 20.38	+ 17.9
	126	114.30	+ 11.70	+ 10.2
	117	114.98	+ 2.02	+ 1.8
	105	115.66	- 10.66	- 9.2
1921.....	100	116.34	- 16.34	- 14.0
	99	117.02	- 18.02	- 15.4
	91	117.70	- 26.70	- 22.7
	101	118.38	- 17.38	- 14.7
1922.....	112	119.06	- 7.06	- 5.9
	124	119.74	+ 4.26	+ 3.6
	130	120.42	+ 9.58	+ 8.0

APPENDIX K

RATES ON 60-90-DAY PAPER ADJUSTED FOR SEASONAL VARIATION

The following adjusted rates are based on the original data given in Appendix F. For the period 1866-1916 they have been corrected by the use of the link-relative indexes of seasonal variation worked out by W. L. Crum (*Review of Economic Statistics*, January, 1923, Vol. V, pp. 17-29). For the period from 1917 to 1922, we have applied one-half the correction used for 1890-1916.

Year	Rate											
	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1866.....	7.64	7.80	7.46	6.92	7.17	7.56	7.49	6.85	5.51	5.14	5.81	6.28
1867.....	7.20	7.45	7.27	7.25	7.67	10.12	8.78	8.19	8.24	9.02	8.56	8.98
1868.....	6.92	7.05	7.66	7.58	7.89	7.80	9.25	7.52	7.03	7.03	8.60	8.08
1869.....	8.02	7.85	9.21	9.40	8.32	11.71	11.71	10.83	10.62	9.33	9.92	9.07
1870.....	8.60	7.55	7.27	6.69	6.63	6.22	7.32	7.80	7.08	6.36	6.06	6.60
1871.....	7.68	6.50	6.01	6.27	5.91	5.91	5.50	5.84	6.42	8.48	7.63	8.80
1872.....	8.93	8.26	8.38	7.95	7.94	7.32	7.49	8.47	10.11	10.01	10.47	9.78
1873.....	9.03	9.21	9.79	10.06	8.98	8.29	7.61	8.08	12.64	15.33	11.74	9.11
1874.....	7.09	6.31	6.30	6.45	6.29	6.60	6.88	5.53	5.67	5.11	5.08	5.35
1875.....	5.51	5.47	6.05	5.58	5.11	5.32	5.02	5.07	5.40	5.59	5.85	5.93
1876.....	6.18	6.15	5.53	5.63	5.73	5.55	4.43	3.65	4.31	4.97	4.99	5.22
1877.....	5.32	4.73	4.56	4.55	4.49	4.73	4.96	5.78	5.81	6.38	5.71	5.00
1878.....	5.60	5.63	5.28	5.48	5.00	4.44	4.20	3.85	4.17	4.80	4.67	4.50
1879.....	4.12	4.00	5.17	5.58	5.00	4.96	4.55	5.63	5.26	5.19	5.67	5.31
1880.....	5.17	5.52	5.64	5.63	5.84	5.32	5.19	5.12	4.76	4.49	4.99	5.35
1881.....	5.03	5.66	5.69	5.31	4.49	4.09	4.67	5.02	5.16	5.50	5.67	5.58
1882.....	5.36	5.91	5.76	5.18	5.45	6.06	5.39	5.73	6.13	5.85	5.89	5.25
1883.....	5.27	5.66	6.54	5.95	6.01	5.55	5.60	5.77	5.44	5.28	5.16	4.91
1884.....	4.74	4.99	4.73	4.83	5.69	6.72	6.94	5.58	4.99	4.84	4.71	4.46

RATES ON 60-90-DAY PAPER ADJUSTED FOR SEASONAL VARIATION.—Continued.

Rate

Year	Rate											
	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1885.....	4.49	4.73	4.56	4.03	4.15	4.15	4.08	3.74	3.40	3.52	4.03	4.01
1886.....	4.13	4.11	3.98	4.35	4.56	4.50	4.60	5.32	5.27	5.33	5.35	5.35
1887.....	5.27	5.06	5.48	5.51	5.84	5.98	7.22	6.44	6.30	5.62	5.26	5.35
1888.....	5.32	5.06	5.35	5.54	5.42	4.96	4.78	4.44	4.79	4.47	4.31	4.43
1889.....	4.45	4.47	4.61	4.35	4.31	4.53	5.13	5.23	4.79	5.28	5.44	5.43
1890.....	5.31	5.44	5.72	5.40	5.51	5.61	5.29	5.41	5.20	5.28	6.91	6.64
1891.....	5.87	5.41	5.46	5.38	5.85	6.17	5.87	5.57	5.25	4.95	4.66	4.38
1892.....	4.29	3.99	4.14	3.68	3.44	3.32	3.64	3.87	4.30	4.62	4.71	5.11
1893.....	5.25	5.38	7.08	6.09	7.24	9.81	10.22	9.39	7.49	5.29	4.03	3.33
1894.....	3.61	3.52	3.12	3.27	3.18	3.26	3.14	2.98	2.97	2.46	2.59	2.62
1895.....	3.20	3.92	4.07	4.21	3.03	2.95	3.09	3.42	3.65	4.28	3.79	4.32
1896.....	6.19	6.29	5.43	5.59	4.93	4.76	5.29	7.56	7.56	7.66	4.92	3.38
1897.....	3.42	3.25	3.49	3.74	3.81	3.50	3.61	3.60	3.71	3.75	3.11	3.11
1898.....	3.35	3.39	4.84	6.09	4.92	3.61	3.84	3.56	3.73	3.05	3.04	2.75
1899.....	2.99	3.38	4.07	3.91	3.92	3.71	3.84	4.21	4.47	4.65	5.01	5.35
1900.....	5.07	4.77	5.08	4.50	3.81	4.14	4.25	4.06	3.93	4.52	4.06	4.32
1901.....	4.15	3.99	3.90	4.22	4.32	4.42	4.51	4.36	4.47	4.16	4.35	4.50
1902.....	4.58	4.33	4.52	4.75	4.93	4.98	4.84	4.69	5.11	5.31	5.29	5.45
1903.....	5.28	5.24	5.75	5.50	5.17	5.72	5.73	5.75	5.43	5.22	5.50	5.32
1904.....	5.06	5.17	4.87	4.30	4.28	3.99	3.70	3.76	3.90	3.94	3.79	3.89
1905.....	4.07	4.16	4.09	4.21	4.33	4.20	4.33	4.07	4.27	4.43	5.21	5.28
1906.....	5.21	5.44	5.49	5.76	5.80	5.89	5.74	5.81	5.94	5.64	5.76	5.68
1907.....	6.34	6.43	6.44	6.27	5.92	6.10	6.03	6.05	6.16	6.31	6.91	7.27
1908.....	6.47	5.48	5.86	4.64	4.29	4.09	3.93	3.48	3.55	3.63	3.71	3.50

RATES ON 60-90-DAY PAPER ADJUSTED FOR SEASONAL VARIATION.—Continued.

Year	Rate											
	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1909.....	3.84	3.82	3.64	3.71	3.74	3.64	3.54	3.89	3.82	4.50	4.68	4.63
1910.....	4.90	4.81	4.68	5.03	5.17	5.39	5.64	5.26	5.00	4.97	5.06	4.24
1911.....	4.10	4.43	4.04	3.88	3.95	4.14	3.96	4.06	4.10	3.89	3.60	4.21
1912.....	4.02	4.06	4.36	4.40	4.56	4.48	4.75	4.84	5.03	5.30	5.27	5.45
1913.....	4.80	5.31	5.98	5.86	5.81	6.59	6.35	5.81	5.23	5.09	5.12	5.16
1914.....	4.67	4.16	3.98	3.97	4.22	4.35	4.72	6.14	6.06	5.76	5.06	3.95
1915.....	3.96	4.06	3.52	3.88	4.05	4.09	3.41	3.42	2.94	2.88	2.74	2.85
1916.....	3.23	3.39	3.26	3.32	3.41	4.07	4.16	3.61	3.06	3.02	3.22	3.55
1917.....	3.60	4.25	4.21	4.40	5.03	5.58	4.79	4.73	4.93	5.08	5.22	5.24
1918.....	5.66	5.91	6.00	6.07	6.13	6.56	6.02	5.84	5.70	5.67	5.72	5.50
1919.....	5.27	5.40	5.49	5.53	5.61	6.17	5.55	5.29	5.11	5.08	5.27	5.60
1920.....	6.09	6.66	6.81	7.01	7.46	8.62	8.02	7.87	7.57	7.55	7.59	7.50
1921.....	7.93	8.06	7.77	7.78	7.21	7.47	6.43	5.85	5.62	5.31	4.97	4.88
1922.....	4.97	5.07	4.88	4.69	4.46	4.50	4.03	3.82	3.98	4.15	4.43	4.40

The corrections were made by applying the following divisors:

INDEXES OF SEASONAL VARIATION.

Period	Index											
	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1866-73.....	1.041	.993	1.032	1.069	.913	.820	.854	.891	.989	1.109	1.180	1.114
1874-89.....	1.044	.951	.976	.977	.890	.856	.857	.986	1.102	1.136	1.103	1.121
1890-1916.....	.970	.924	.961	.944	.919	.892	.954	1.033	1.105	1.118	1.086	1.100
1917-22.....	.985	.962	.9805	.972	.9595	.896	.977	1.0165	1.0525	1.059	1.043	1.050

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