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CHAPTER 8

Long Swings in Financing of Capital Formation

Introduction

In the preceding chapter we discussed the alternations in the rates of additions to or growth of real flows (capital formation, national product) and population. The procedures employed were simple, and the significance of the findings should not be exaggerated. In particular, no claim is made that these alternations are periodic, or that we know the mechanism that produces them. But whether we use moving averages or averages for reference or specific cycles to eliminate the effects of fluctuations associated with business cycles, the resulting totals do not display uniformly constant, uniformly accelerating, or uniformly decelerating rates of growth. The growth rates are for a period above or for a period below the underlying long-term trend, and the magnitude of these deviations above or below the underlying trend line is too large to be disregarded. Hence the need for segregating these alternations in rates of growth for separate study, and their designation as long swings is a semantic facility that should not mislead us into ascribing to these movements an unwarranted connotation of regular periodicity.

Two arguments against treating this component separately should be faced. The first points to the fact that over the last forty to fifty years the timing and characteristics of the long swings were much affected by the two world wars. The latter caused the deep troughs in residential construction and materially affected the structure of both capital formation and national product. Furthermore, while the major depression of the 1930's was an even more important factor in setting the trough of the last long swing, it in turn reflected in good part the dislocations World War I produced in this country and elsewhere. It may, therefore, be argued that, at least since 1914, long swings have been largely a result of world wars; and it is hardly justifiable to treat these long swings as an aspect of economic growth dissociated from what are major incidents in international relations. In considering this argument, we cannot deny that world wars put a distinctive stamp on the long swings in rate and structure of economic growth. But this means only that when such wars occur, they modify the dates and affect the amplitude of the long swings compared with what they might have been otherwise. It does not mean that had there been no world wars there would have been no long alternations in the rate and structure of growth. They occurred in this country between the 1880's and 1914, and for some aspects of the economy can be seen in the record of economic growth between the 1830's and the Civil War. Any consideration of the bearing of the analysis of past trends upon even a future assumed to be warless must take account of the finding that, over the period covered by the record, the rates of secular growth for some major aspects of the economy (construction, additions to population, internal migration, and others to be discussed below) have been subject to long alternations even during decades of peace.

The second argument relates to the statistical procedure employed in Chapter 7 and to be followed here. The use of moving averages covering a long period—such as a decade—introduces a semblance of long continuous swings even when no such continuity characterizes the underlying data. A big change, such as a pronounced cyclical expansion followed by a mild contraction, or an especially severe depression, or a large annual bulge or trough—each transient in the sense that it may characterize just one or two or three years—will, in the calculation of a ten-year moving average, raise or depress the ordinates of that average over the ten successive items in which it is included. The continuous swings in our charts may, therefore, be statistical illusions. Given the procedure employed, all that is needed to produce those swings, apparently, is the occurrence, at roughly equal intervals, of an exceptionally large transient change, upward or downward.

The formal validity of this argument cannot be denied: transient changes of unusual magnitude may, when smoothed by a long-period average, produce apparent long swings. But it does not follow that, where moving averages reveal long swings, the latter are necessarily due to the "stretching out" of a few large transient changes. The underlying detailed data may, in fact, without any averaging, reveal long swings which, with their wide amplitude, dominate the shorter-term fluctuations associated with business cycles. In such cases the moving averages yield a picture of long swings less affected by the short-term fluctuations in the more detailed data, but they in no sense create the continuous long-term alternations in the rate of growth. And for several important components of economic activity the annual data do reveal the long swings suggested above: gross and net immigration to this country; annual increments in population for the recent periods (since 1930), when they are not derived by linear interpolations between census dates; nonfarm residential construction; expenditures on durable capital equipment (construction and producers' durables) in many of the regulated industries; additions to capital in manufacturing industries; and changes in the annual balance of international payments.

Even when the amplitude of long swings relative to that of short-term fluctuations is not so dominant that such swings can be observed clearly in the annual (or more detailed) time series, the emergence of long swings after the series have been averaged for successive cycles or smoothed by means of long-period moving averages is not necessarily a statistical illusion. Two somewhat distinct cases can be considered.

In the first case we assume that the economic process measured in the series fluctuates within a fairly narrow range, the fluctuations being combined with an underlying secular movement of any magnitude. If, then, a sharp upward change occurs during a given year, and no offsetting change follows immediately, the smoothing of the underlying data by, say, a ten-year moving average will lift the level of the average over a ten-year period. The rise will be followed by a drop in the sixth year following that of the assumed large upward change (if the average is centered at the mid-point). The semblance of a continuously high level for ten years, followed by a continuously lower level—the effects of the underlying long-term trend being allowed for—is, then, an illusion, in that the series was above the secular level for one year, not ten. But is such a hypothetical example consistent with what we must assume concerning the operation of the economic system? We would ordinarily expect the economic process to respond to a sharp disturbance by canceling it, if that disturbance does not correspond to the underlying determinants. If, by some accident, the output of a commodity rises steeply above its secular level, we would expect, all other conditions being equal, a relative decline in prices of that commodity, a subsequent fall in output in response to the price decline, and the emergence of deviations below the secular level that would offset the original upward disturbance. The inference would apply to an equal degree in the case of a sharp downward break in output. And if the economic process reacts to this annual bulge or trough, either would affect a moving average for only a year—not for the full decade involved in the period of cumulation. It is only if we conceive the transient changes as purely random, that is, assume independence among successive values, that the moving average will produce the statistical illusion we are considering. In the case of economic time series, in which we expect a deviation from an underlying secular movement to produce an offsetting effect, there is no such independence among successive deviations (i.e., the serial correlation coefficient among irregular changes should be significantly negative). Therefore, the emergence of long swings in a decadal moving average cannot be reduced to what is essentially a stretching out of random transient changes. In a situation in which at intervals there is an upward or downward change not offset by an immediate reaction in the opposite direction, the long-term swings in the original data may be viewed as genuine because of the very absence of an immediately offsetting reaction.

The same logic applies to the other case—a more realistic one—where we recognize the existence of cyclical fluctuations in the underlying detailed data, but assume that one of the cycles is exceptionally severe or exceptionally mild. To produce the effect of a long swing, such severity or mildness must refer to an imbalance between expansion and contraction. In other words, because of a contraction exceptionally severe in relation to the preceding or following expansion or an expansion exceptionally pronounced in relation to the preceding or following contraction, the average for the cycle as a whole is below or above the long-term secular level. If we can conceive successive cycles as units of a random universe—assume no significant correlation between the deviation of a given cycle average from the underlying secular trend and the deviation of the preceding or next cycle from that trend—a moving average may generate long swings that are statistical illusions because of the stretching out of a single deviation of a cycle average from the long-term level.

Here again, however, assuming such independence—randomness—of successive cycle averages means an implicit denial of the significance of the underlying secular trend as a reflection of forces setting a path of movement for the economic process, to which it will tend to return when disturbed. If a given cycle is above the secular average, we would expect the next cycle to be below the secular average, and vice versa. This does not mean that the negative serial correlation should be perfect; but it does mean that, in the absence of significant forces working to the contrary, negative correlation should be the rule, and disturbances capable of generating a long swing through moving averages should be few and far between.

The major point for both cases can be put somewhat differently. The responsiveness of economic processes to short-term disturbances, which bars conceiving them as purely random changes (whether such randomness be applied to annual or cycle-average values), means a significant negative correlation between the successive values. Given such negative correlation, the probability that moving averages will generate long swings as statistical illusions becomes much less than in cases where we deal with truly random changes. This must be taken into account in considering the justification for segregating the long swings for separate study, along with the fact, noted previously, that in many important components of national product and capital formation the long swings are conspicuous even before short-term fluctuations are reduced by means of cycle averages or moving averages.

These somewhat technical arguments having been dealt with, we now consider long swings in the financing of capital formation. The financing processes are far more volatile than the real flows discussed in the preceding chapter, and the effects on them of wars and business cycles are far more prominent. It may seem at times that long swings are statistical artifacts far removed from reality, which fluctuates so widely in the short run. In a sense this impression is true: if the annual or cyclical ups and downs are violent, the resulting averages and trends are more in the nature of fiction than they are if the short-term fluctuations are within a narrow compass and the long-term movement dominates the picture. But this does not render completely unreal the movements that transcend in duration the more violent cycles or other short-term fluctuations—so long as we have institutions (and there are many) that survive the cycles and that adjust in their response and planning to periods beyond the next cyclical expansion or contraction. Therefore, just as we attempted to establish the long-term trends in financing (in Chapters 5 and 6), despite the fact that those trends are quantitatively limited relative to the short-term fluctuations of the financing ratios in the course of business cycles or of war periods, so we must consider the long swings in at least some financing ratios.

Unfortunately, few direct data are available except for recent decades in which wars dominate the picture and when the conclusions are too obvious to warrant discussion. The two world wars, of course, had an immediate effect on the structure of countrywide financing, with the major shifts from equity to debt and from private to government debt. Just as clearly, the postwar prosperity periods affected the ratio of internal to external financing, and of debt to equity financing. Much of the material in Chapters 5 and 6, where we had to select periods similar with respect to position in the long swings in order to make inferences concerning underlying trends, is in fact relevant here, and need not be repeated. Our main interest should be in the earlier decades, which were not so markedly affected by wars and their aftermath, but for which direct information on financing of capital formation is quite scarce.

Under the circumstances, we must resort to indirect evidence. The next two sections present several types of such indirect evidence. The final section gives actual examples relating to swings in financing ratios for selected sectors of the economy—examples borrowed from the monographs in this series that deal with the capital using sectors.

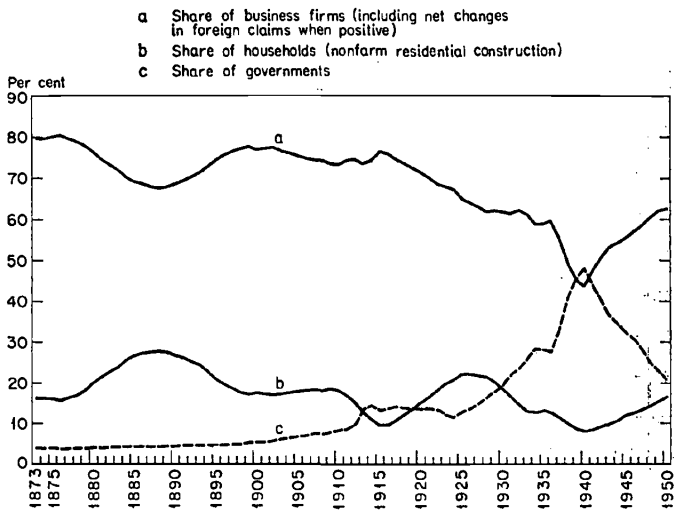
The Structure of Capital Formation, in Current Prices

One type of indirect evidence on long swings in financing is provided by the data on changes in the components of capital formation, in current prices. The bearing of those changes may be stated as follows. We assume that, by and large, it is capital formation that gives rise to financing—particularly external—and in fact we are interested in how capital formation was financed, not in the general use of credit funds. If, then, there are distinct and persistent differences in the way the several components of capital formation are financed, changes in the proportional share of such components in total capital formation should give rise to changes in the proportional magnitude of various types of financing. For example, if we assume that, by and large, inventory accumulation is financed by short-term borrowing, whereas accumulation of fixed durable capital is financed either by internal funds or by long-term external funds with the proportions of the two assumed constant, shifts in the distribution of capital formation between inventory accumulation and accumulation of fixed capital will produce corresponding changes in the apportionment of total financing between internal and external, and within external, between short-term and long-term.

The qualifications attached to such tying of types of capital formation to distinctive sources of financing were discussed in Chapter 5. For the present it suffices to say that the connections between types of capital formation and their financing, while not close and absolutely

CHART 14

Structure of Gross Capital Formation in Current Prices, by Category of User, 1869–1955

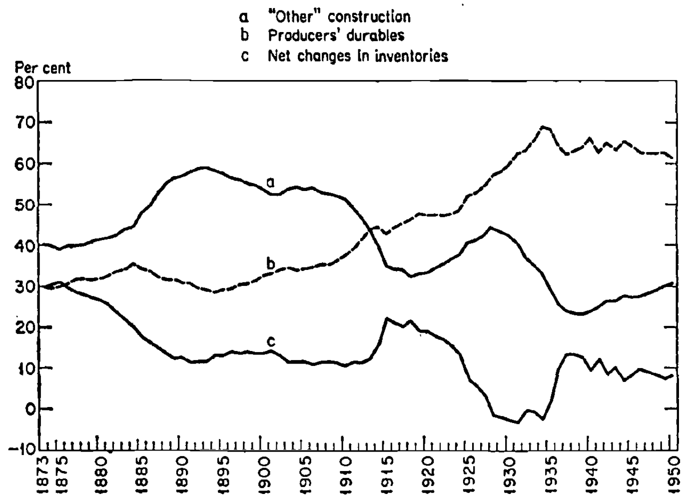


invariant, are sufficiently realistic so that if there are marked long swings in the distribution of capital formation among its components (all in current prices, because the current price volumes are more directly tied in with financing than the constant price volumes are), and if the components are marked by persistent differences in the structure of financing, there will result long swings in the distribution of total financing of capital formation among different sources.

It is this rationale that underlies the presentation of the data in Charts 14 through 16. In Chart 14, we show the percentage apportionment of total gross capital formation (including military construction and munitions, and excluding net changes in foreign claims when negative) among the three major user categories: nonfarm residential construction (used preponderantly by private households), government capital formation (comprising government construction and munitions), and business capital formation (which, being a residual, includes farm and nonfarm, corporate and noncorporate, as well as net changes in claims against foreign countries when positive). Chart 15 shows the percentage apportionment of gross domestic business capi-

CHART 15

Structure of Gross Domestic Business Capital Formation in Current Prices, by Type of Capital Good, 1869–1955



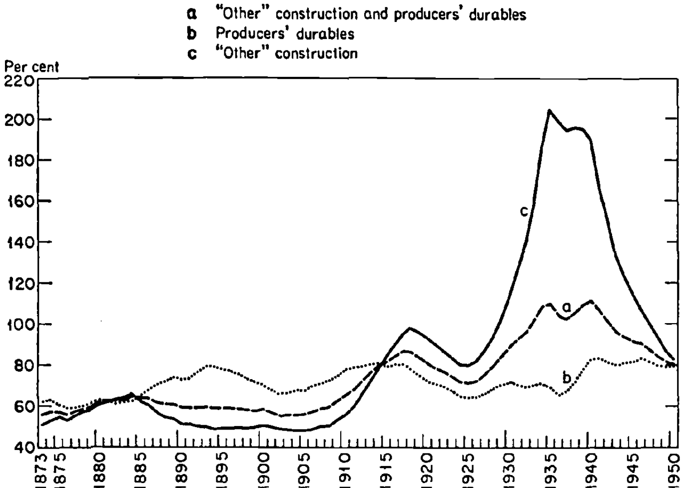
tal formation, by type of capital good: construction, which in this case excludes nonfarm residential and government construction; producers' durable equipment; and net changes in inventories. Chart 16 shows, for durable domestic business capital formation, the proportion of estimated capital consumption to gross volumes. In all three charts, the percentage shares are based on ten-year moving averages of totals in current prices, centered on the fifth year.

The first point to be noted is that long swings in the various aspects of the structure of capital formation in current prices are quite prominent, even before the second half of the period, which is marked by world wars and their aftermath. This is what we would have expected from the discussion, in Chapter 7, of the volumes in constant prices.

But relative price movements might well have exhibited long swings inversely related to those in real volumes, i.e., to those in constant prices. If they had, the distributions of the totals in current prices would not have shown long swings. That the swings do emerge means either that the swings in relative prices were not inverted to those in real volumes or, if inverted, were of far narrower amplitude.

CHART 16

Capital Consumption as Per Cent of Gross Durable Domestic Business Capital Formation, 1869–1955



To illustrate the implications of Charts 14–16 for long swings in the structure of financing, we give, for selected years, the actual percentage shares shown in the three charts (Table 69). The basis for selecting the years differs somewhat from chart to chart, but in general, the intent was to choose those that marked the points of greatest difference in the structure of capital formation—the years in which the lines shown in the charts either converged most or diverged most. For Chart 14 this end was attained by choosing the turning points in the share of nonfarm residential construction; for Chart 15 the choice was based largely on the turning points in the shares of construction and of net changes in inventories; for Chart 16 the dates are those of turning

TABLE 69

STRUCTURE OF CAPITAL FORMATION, CURRENT PRICES, SELECTED YEARS, 1871–1955

A. PERCENTAGE SHARES IN TOTAL GROSS CAPITAL FORMATION,[a] BY CATEGORY OF USER

Year	Households[b] (1)	Governments (2)	Business Firms[a] (3)
1. 1876	15.7	3.8	80.4
2. 1888	27.9	4.2	67.8
3. 1902	16.8	5.6	77.6
4. 1909	18.5	7.9	73.6
5. 1915	9.6	13.4	77.0
6. 1926	22.1	13.6	64.2
7. 1940	8.1	48.2	43.7
8. 1950	16.5	20.8	62.8

B. PERCENTAGE SHARES IN GROSS DOMESTIC BUSINESS CAPITAL FORMATION, BY TYPE OF CAPITAL GOOD

Year	*Durables* "Other" Construction (1)	*Durables* Producers' Durables (2)	Net Changes in Inventories (3)
9. 1875	39.0	30.0	31.1
10. 1884	44.4	35.5	20.1
11. 1892	58.8	29.5	11.7
12. 1901	52.6	33.1	14.3
13. 1910	51.7	37.7	10.6
14. 1918	32.4	46.3	21.3
15. 1928	44.4	57.3	−1.6
16. 1938	23.3	63.1	13.7
17. 1950	30.7	61.2	8.1

C. RATIO (%) OF CAPITAL CONSUMPTION TO GROSS DOMESTIC BUSINESS CAPITAL FORMATION

Year	"Other" Construction (1)	Producers' Durables (2)	Total Durables (3)	Total (4)
18. 1875	54.4	60.9	57.2	39.5
19. 1884	65.8	62.3	64.2	51.3
20. 1902	48.5	65.3	55.1	47.7
21. 1917	94.1	80.1	86.1	68.7
22. 1925	79.7	64.4	71.1	66.0
23. 1940	189.5	83.2	111.4	100.6
24. 1950	82.1	79.8	80.6	74.0

Percentages and ratios are based on ten-year moving averages of annual volumes centered on the fifth year.

[a] Including net changes in foreign claims when positive.

[b] Nonfarm residential construction.

(Notes on following page)

NOTES TO TABLE 69

SOURCE: Based on the annual series underlying, or shown in, the following tables:

PART A

Gross capital formation: Table R-29, col. 1, and Table R-34, col. 3.
Households (nonfarm residential construction): Table R-30, col. 1.
Governments: Table R-30, cols. 2 and 3, and Table R-6, col. 4.
Business firms: gross capital formation minus nonfarm residential construction and government capital formation.

PART B

Gross domestic business capital formation is the sum of the following:
"Other" construction: from Table R-30, col. 1.
Producers' durables: from Table R-33, col. 1 and Table R-6, col. 4.
Net changes in inventories: Table R-34, col. 1.

PART C

Gross domestic business capital formation is the same as for part B.
Capital consumption:
"Other" construction: Table R-31, col. 4.
Producers' durables: Table R-33, col. 2, and Table R-6, col. 6.

points in the long swings in the ratio of capital consumption to the total of construction and producers' durables.

Using the percentage shares in Table 69, we attempted some calculations that would illustrate the effects on the structure of financing. In Tables 45 and 46, total uses for the business sector for the first decade of this century were about 1.4 times gross capital formation, the corresponding ratio for government was 1.5, and that for nonfarm residential construction, 1.0. For the same decade, the proportion of internal financing (gross retention) to total uses was 0.59 for business, about 0.5 for government, and 0.65 for nonfarm residential construction. Let us assume that the ratio of total uses to gross capital formation for the earlier decades was the same as that for 1901–1910 (or 1900–1909), but that the ratio of internal financing to total uses was 0.5 for business, 0.5 for government, and 0.7 for nonfarm residential construction. On this assumption the countrywide proportion of gross retention to total uses for 1876 would be $[(80.4 \times 1.4) \times 0.5] + [(3.8 \times 1.5) \times 0.5] + [(15.7 \times 1.0) \times 0.7]$ divided by $(112.6 + 5.7 + 15.7)$, or 0.52. A similar calculation would show a fraction of 0.54 for 1888, and 0.53 for 1902. In other words, the proportion of internal financing to total uses increased somewhat from the trough of the nonfarm residential construction cycle to the peak and then declined again to the trough. If, in general, nonfarm residential construction is characterized by a high ratio of internal financing to total uses, the long swing of its share in the total will, *ipso facto,* mean a corresponding long swing in the share of internal financing in the countrywide total of uses of funds.

The changes in the share of internal financing (gross retention) in total sources (uses) derived above to illustrate the implication of the first long swing in Chart 14 may seem quite small. But it must be remembered that we deal here with large sectors, and that the assumed difference among them in the share of internal financing in total sources is not large. If we had assumed that the share for nonfarm residential construction was 0.8 instead of 0.7, and that for business was 0.4 instead of 0.5, the long swing in the proportion of internal financing to total would have been more prominent.

Similar illustrations can be devised for the other aspects of the structure of capital formation in current prices in Charts 15 and 16. If we assume that net changes in inventories are all financed by short-term borrowing, and that the other elements in gross domestic business capital formation are financed half by external long-term financing and half by gross retention, the ratio of total internal financing to gross business capital formation would rise from 0.345 in 1875 to 0.44 in 1892; and of the 0.655 share of external financing in 1875, 0.344 would be long-term and 0.311 short-term; whereas in 1892, of the 0.56 of external financing, 0.44 would be long-term and 0.12, short-term. (All of the figures are calculated from part B of Table 69 relating to Chart 15.) Finally, if we can assume that, by and large, capital consumption charges are earned, the entries in part C of Table 69 show the swings in one major component of the share of internal financing in total.[1]

The purpose here is not to assign precise values to the links between the long swings shown in the three charts (and in the underlying data) and the implicit long swings in the structure of financing (total or business alone). It is rather to suggest the links by which the observed long swings in the distribution of capital formation in current prices among components can generate long swings in the structure of financing. Given the hypotheses concerning the association between type of

[1] The totals of capital consumption underlying Chart 16 and part C of Table 69 should be not reproduction values (as they are) but original cost—if they are to correspond to customary practices of business accounting. But one may argue that when, because of price rises, reproduction cost is higher than original cost, the use of the former allows for the associated rise in accounting net profits, with an opposite allowance in periods of declining prices and of replacement cost below original cost. At any rate, for illustrative uses the difference is not important, and the extra calculations involved in securing capital consumption charges based on original cost did not seem worth while.

asset and uses and type of financing, such long swings will be generated unless there are offsetting movements in the proportions of various sources of financing for each sector distinguished. There is, however, no reason to expect such offsetting movements.

Price and Yield of Securities

Another body of indirect evidence that can shed some light on long swings in financing, and indeed on those in real flows, is the price and yield of securities. In Chart 17 we show nine-year moving averages of the longest available series on the price of stocks, for major industrial groups and for all stocks, and in Table 70 we record the turning points of the long swings in the index for all stocks, and measure within these phases the changes in each of the four stock-price indexes.

Three observations are suggested by the evidence. First, for at least two of the stock groups (railroad and utility) prices show marked long swings, of sizable amplitude, and averaging about twenty years in duration. The swings in the index of prices of industrial stocks are

CHART 17

Nine-Year Moving Averages of Indexes of Stock Prices, Total and Major Groups, 1871–1956

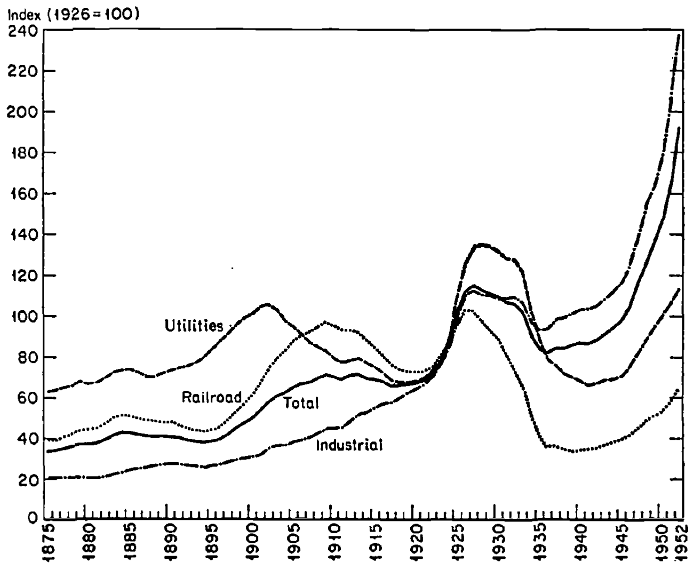


TABLE 70

CHANGES IN STOCK PRICES DURING PHASES OF LONG SWINGS IN THE PRICE INDEX FOR ALL STOCKS, 1871–1956

(index, 1926 = 100)

		Total (1)	Railroad (2)	Utilities (3)	Industrial (4)
A. INDEXES OF STOCK PRICES AT DATES OF TURNING POINTS IN COLUMN 1					
1. First trough,[a] 1875		33.6	38.8	63.0	20.2
2. Peak, 1885		42.6	50.7	73.6	24.1
3. Trough, 1894		38.0	43.7	79.2	25.8
4. Peak, 1909		70.9	96.9	82.7	44.3
5. Trough, 1917		65.5	75.9	68.5	57.4
6. Peak, 1927		114.9	103.4	134.5	112.8
7. Trough, 1936		81.8	35.8	79.4	93.4
8. Last peak,[a] 1952		191.9	64.2	113.2	238.0
B. CHANGES PER YEAR DURING SUCCESSIVE PHASES					
9. Trough to peak	(line 1 to line 2)	+0.90	+1.19	+1.06	+0.39
10. Peak to trough	(line 2 to line 3)	−0.51	−0.78	+0.62	+0.19
11. Trough to peak	(line 3 to line 4)	+2.19	+3.55	+0.23	+1.23
12. Peak to trough	(line 4 to line 5)	−0.68	−2.62	−1.78	+1.64
13. Trough to peak	(line 5 to line 6)	+4.94	+2.75	+6.60	+5.54
14. Peak to trough	(line 6 to line 7)	−3.68	−7.51	−6.12	−2.16
15. Trough to peak	(line 7 to line 8)	+6.88	+1.78	+2.11	+9.04
C. CHANGES BETWEEN SUCCESSIVE PHASES					
16. Trough to trough	(line 9 to line 10)	−1.41	−1.97	−0.44	−0.20
17. Peak to peak	(line 10 to line 11)	+2.70	+4.33	−0.39	+1.04
18. Trough to trough	(line 11 to line 12)	−2.87	−6.17	−2.01	+0.41
19. Peak to peak	(line 12 to line 13)	+5.62	+5.37	+8.38	+3.90
20. Trough to trough	(line 13 to line 14)	−8.62	−10.26	−12.72	−7.70
21. Peak to peak	(line 14 to line 15)	+10.56	+9.29	+8.23	+11.20

[a] First or last year included in all series.

Indexes are based on nine-year moving averages of annual series and are centered on the fifth year.

SOURCE, ANNUAL SERIES

1871–1937: *Historical Statistics of the United States, 1789–1945,* Series N-215–N-218.

1938–1956: Extrapolated from 1937 by the Standard and Poor series, splicing by the average ratio for 1935–1937. Series are given in *Business Statistics, 1957 Biennial Ed.* (Supplement, *Survey of Current Business*), p. 101.

much less clearly marked, and are not apparent until the early 1880's. The index for all stock prices (weighted by the volume of all stock issues) shows clear and prominent swings. In other words, we find long alternations in the rate of movement, not only in the real volume of some types of productive activity and in additions to population, but also in stock prices, where they presumably reflect the general estimate of the long-term prospects of growth and growth profits.

Second, the timing of the long swings in the index of prices for all stocks is close to that in gross national product, flow of goods to consumers, and population-sensitive capital formation (see Table 66). The first observable trough was in 1875 (and it may well have been in 1873, as was the case with gross national product); the first peak was in 1885, between that for gross national product (1882) and that for population-sensitive capital formation (1890); the next trough was in 1894, a year after the trough in gross national product but in advance of the trough in population-sensitive capital formation. From then on the coincidence has been quite close.

Third, Table 70 suggests and Chart 17 confirms the impression that before World War I there was significant divergence in the long swings among the three groups of stocks. The railroad stock prices moved in closest conformity with the general index, and hence in closest conformity with the real flows represented by national product. The utility stock prices moved somewhat differently in that they showed a trough in 1886–1887 (whereas the general index did not reach a trough until 1894), and a peak in 1902 (much earlier than the peak in the general index), perhaps reflecting the phase of the fastest growth of the nonrailroad utilities. We have already noted that the industrial stock prices failed to show a significant upswing until the early 1880's, and that upswing extended to the early 1890's rather than to the middle 1880's (the trough in the index of prices for all stocks). Departures from the common pattern during the period affected by World War I can be explained by the differential effect of war and inflation on the prices of stocks in sectors like railroads and utilities which were restricted by price regulation, compared with the industrial group in which profits were unrestricted. The discrepancies in timing of the long swings in the earlier periods must have been associated with differences in the timing of the swings in rates of growth of the sectors involved. In other words, just as in Chapter 7 we found that before World War I the long swings in the components of national product differed in timing (particularly as between the population-sensitive and other elements in capital formation), so we find here the long swings in stock prices for various sectors diverging before World War I. The data, however, do not permit us to trace specific associations between long swings in stock prices and in real flows for individual sectors.

All of this, while of some interest for what it adds to the picture of long swings in economic activity, has only a remote bearing upon financing. Alternations in the prices of stocks do not necessarily mean similar movements in the use of new stock issues for purposes of financing, either in absolute terms or relative to the use of other credit instruments or of internal financing.

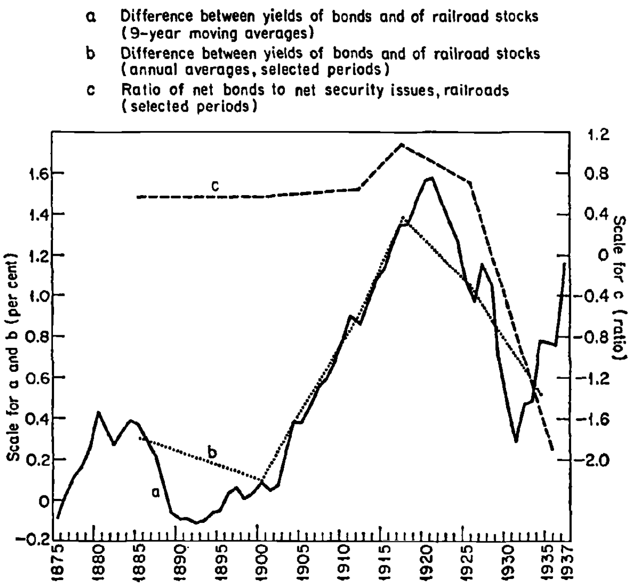
There is, however, a way to suggest the bearing upon financing. From series on stock prices and on dividend payments we can calculate stock yields—the ratio of dividend payments to the current price of stocks. This ratio does not necessarily reflect the actual cost of new stock issue money to corporations that use this means of financing their capital expenditures, because the price at which a new security can be marketed may be different from that of extant issues, and the current payment of dividends is not necessarily the minimum price that has to be paid for marketability of a new issue. However, barring disturbances such as wars (when other circumstances affect the yield of stocks and its relation to prices of new stock money), we can assume that the long-term movements in stock yields do approximate fluctuations in the cost of equity money to corporations. We may, then, compare stock yields with bond yields and argue that if the difference in favor of bond yields increases (if bond yields are increasingly lower than stock yields), there should be, other conditions being equal, a shift in the distribution of new issues in favor of bonds, and the opposite effect should be found if the difference in favor of bonds decreases. Hence, if there are long swings in the stock-bond-yield differentials, there should be corresponding long swings in the distribution of new issues between stocks and bonds.

This is the rationale for the comparison in Chart 18. Line *a* is a nine-year moving average of the difference between yields of railroad stocks and of high-grade twenty-year bonds, adjusted for maturity. It does not go beyond 1937, because the subsequent averages begin to reflect the abnormal interest rates and bond yields of World War II, and also because for the last decade for which we have data on new railroad security issues (1940–1949), both stocks and bonds declined.

If we had an annual series on net bond and stock issues of railroads from which we could compute the nine-year moving average of the ratio of the former to the latter, we would expect it to move as the ratio in line *a* moves. However, our data on net bond and stock issues for railroads are easily available only for the long periods covered in Ulmer's monograph. In Table 71 we have taken them gross of invest-

CHART 18

Average Differential between Yields of Bonds and of Railroad Stocks Compared with Average Ratio of Net Bonds to Net Security Issues of Railroads, 1871–1941



ment in affiliated companies (because such investment is not apportioned between stocks and bonds) and we also show the ratio of net bond issues to total net security issues (line *c* in the chart, drawn by connecting the mid-points of the six periods distinguished). To facilitate comparison, we also calculated annual averages of the stock-bond-yield differential for the same periods (line *b* in the chart).

With one exception—the movement from 1880–1890 to 1893–1907—the correspondence is what we would have expected. The differential in favor of bonds (column 1) rises from 1893–1907 to 1907–1916 and further to 1914–1920, and over these two intervals the ratio of bonds to total issues (column 5) rises from 57 per cent to well over 100 per cent. The differential declines from 1914–1920 to 1921–1930 and still further to 1931–1937 (which we take to represent the decade of the 1930's, excluding the effects of World War II), and the ratio of net bonds to total net security issues declines precipitously. The only exception is the failure of the bond ratio to decline when the differential

TABLE 71

AVERAGE DIFFERENTIAL BETWEEN YIELDS OF BONDS AND OF RAILROAD STOCKS COMPARED WITH AVERAGE SHARE OF NET BONDS IN NET SECURITY ISSUES OF RAILROADS, SELECTED PERIODS, 1880–1940

		Per Cent of Total Sources (Uses)			
Period	Average Yield Differential (%) (1)	Net Stock Issues (2)	Net Bond Issues (3)	Total Net Issues (2) + (3) (4)	(3) as % of (4) (5)
1. 1880–1890	0.30	43.0	54.9	97.9	56.1
2. 1893–1907	0.10	47.5	63.8	111.3	57.3
3. 1907–1916	0.89	35.0	60.1	95.1	63.2
4. 1914–1920	1.38	−3.0	36.5	33.5	109.0
5. 1921–1930	1.05	14.8	37.1	51.9	71.5
6. 1931–1940	0.52	11.9	−22.6	−10.7	−189.9 [a]

[a] Col. 3 as percentage of col. 2 (because col. 4 is negative).

SOURCE, BY COLUMN

(1) Obtained by subtracting bond yields from railroad stock yields, and then averaging (weighting terminal years according to number of months covered by census data) for the years indicated. For line 6, the average relates to 1931–1937 only, because later ordinates of the nine-year moving averages reflect the World War II years with their artificially low bond-yield rates. The bond and stock yield series are from the following sources:

Bond Yield Series: 1900–1952, from *Historical Statistics of the United States, 1789–1945*, and *Continuation to 1952*, Series N-199. Extension through 1955 is by the series of corporate bonds, 20-year maturity, given in *Statistical Abstract of the United States, 1956*, Table 551, p. 466. Extension back through 1880 is from Frederick R. Macaulay, *Some Theoretical Problems Suggested by the Movements of Interest Rates, Bond Yields and Stock Prices in the United States since 1856* (New York, NBER, 1938), Table 5, col. 3, pp. A111-112. The series for best five bonds is used without splicing, inasmuch as the difference between the series in 1900–1902 is too small to call for any adjustment.

Stock Yield Series: 1880–1937, from *Historical Statistics*, Series N-208. 1938–1955 is the Standard and Poor series in *Statistics; Security Price Index Record, 1957*, pp. 100–103. The series were not spliced inasmuch as the overlapping figures for 1937 were close, although those for 1936 differed considerably.

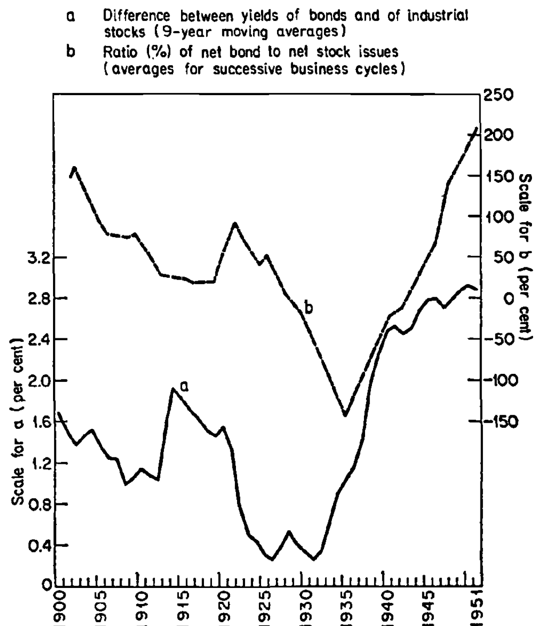
(2) to (4) Gross of investment in affiliated companies. The data are from Melville J. Ulmer, *Capital in Transportation, Communications, and Public Utilities: Its Formation and Financing* (Princeton for NBER, 1960), Table 46, p. 150.

in favor of bonds declined from 1880–1890 to 1893–1907. While the comparison is necessarily crude, because so few long periods can be used, it does corroborate the responsiveness of the bond-stock ratios to bond-stock-yield differentials. The long swings in the latter can be assumed, therefore, to produce long swings in that aspect of the structure of financing.

A somewhat more telling comparison can be made for mining and manufacturing corporations, but only for the years since 1900. Here we calculate the differential between the yields of industrial stocks and those of high-grade twenty-year bonds (the bond yield index used in the comparison for railroads). Nine-year moving averages of this differential appear in Chart 19, in this case through World War II and later years. We compare this series with the ratio of net bond issues to net stock issues (stocks are used as the denominator rather than total net security issues to minimize the number of periods with negative

CHART 19

Average Differential between Yields of Bonds and of Industrial Stocks Compared with Average Ratio of Net Bond to Net Stock Issues of Manufacturing and Mining Corporations, 1896–1955



bases), the ratio being averaged for the successive business cycles, positive and inverted. The underlying entries, for the mid-point of each cycle, appear in Table 72. Both lines in Chart 19 describe long cycles: a downward phase from 1900 (or 1902) to either 1912 or the end of 1916; then an upswing to a peak either in the middle of the 1910–1920 decade or at the beginning of the 1920's; a trough in either the early or the mid-1930's; and an upswing to the 1950's. Also, there is rough positive correspondence between the two lines—in accordance with the hypothesis advanced here—although the bond-stock ratio tends to lag behind the bond-stock-yield differentials. The major exception occurs during the years of World War I which are marked by exceedingly large excesses of stock over bond yields, the war having caused a rise in profits and dividend payments of industrial corporations far beyond the rise in market prices of the securities. One could argue that in those years stock yields were far above the minimum needed to attract more money into new securities, and—in terms of our hypothesis—the yield differentials were substantially exaggerated. If one were to lower correspondingly the nine-year moving averages of the yield differentials centered in 1913–1917, the trough in the differentials might well come closer in time to the trough in the bond ratios, and the peak in the differentials would be in 1920. But whether or not such *ad hoc* reasoning is justified, the conclusion remains that there is broad similarity in the long swings in the stock-bond-yield differentials and in the distribution of new issues between stocks and bonds.

It would have been useful to apply the same kind of analysis to the cost of all external financing relative to internal, to ascertain whether there were long swings in the differentials and corresponding long swings in the distribution of total financing between internal and external. But we would need measures of the possible yields on funds from internal sources if invested elsewhere relative to the possible costs of external funds. Even if we had adequate measures of the latter, the estimation of the former would be extremely hypothetical. All we can do at present is to indicate the susceptibility of differentials in yields of various types of credit instruments to long swings, and to suggest that they may be productive of similar swings in the structure of financing, given no offsetting movements on the demand side. And with this suggestion we turn to the limited direct evidence on long-term alternations in financing ratios for selected capital using sectors.

TABLE 72

AVERAGE DIFFERENTIAL BETWEEN YIELDS OF BONDS AND OF INDUSTRIAL STOCKS COMPARED WITH RATIO OF NET BOND TO NET STOCK ISSUES OF MANUFACTURING AND MINING CORPORATIONS, SUCCESSIVE BUSINESS CYCLES, 1900–1953

(amounts in millions of dollars)

Dates of Successive Business Cycles (Positive and Inverted)	Mid-Point of Business Cycle (1)	*Net Issues Per Year* Stocks (2)	*Net Issues Per Year* Bonds (3)	Ratio (%) (3) to (2) (4)	Average Yield Differential Centered on Year Shown in (1) (%) (5)
1. 1899–1903 [a]	1901.5	167	249	149.1	1.98
2. 1900–1904	1902	158	254	160.8	2.05
3. 1903–1907	1905	132	124	93.9	1.24
4. 1904–1908	1906	143	113	79.0	1.07
5. 1907–1910	1908.5	164	124	75.6	0.84
6. 1908–1911	1909.5	177	140	79.1	0.75
7. 1910–1913	1911.5	224	104	46.4	1.32
8. 1911–1914	1912.5	212	59	27.8	1.35
9. 1913–1918	1915.5	295	70	23.7	2.24
10. 1914–1919	1916.5	410	78	19.0	2.29
11. 1918–1920	1919	878	182	20.7	1.00
12. 1919–1921	1920	815	427	52.4	0.41
13. 1920–1923	1921.5	442	406	91.9	0.53
14. 1921–1924	1922.5	385	283	73.5	0.60
15. 1923–1926	1924.5	529	224	42.3	0.53
16. 1924–1927	1925.5	569	304	53.4	0.53
17. 1926–1929	1927.5	953	55	5.8	0.07
18. 1927–1932	1929.5	733	−146	−19.9	0.38
19. 1929–1937	1933	259	−249	−96.1	0.58
20. 1932–1938	1935	174	−249	−143.1	0.72
21. 1937–1944	1940.5	133	−26	−19.5	2.71
22. 1938–1946	1942	234	−28	−12.0	2.54
23. 1944–1948	1946	798	548	68.7	1.99
24. 1946–1949	1947.5	810	1,125	138.9	2.66
25. 1948–1953	1950.5	707	1,394	197.2	3.52
26. 1949–1953	1951	691	1,437	208.0	3.55

[a] Average covers 1900–1903.

SOURCE, BY COLUMN

(2) and (3) From Daniel Creamer, Sergei Dobrovolsky, and Israel Borenstein, *Capital in Manufacturing and Mining: Its Formation and Financing* (Princeton for NBER, 1960), Table 51, pp. 162–163.

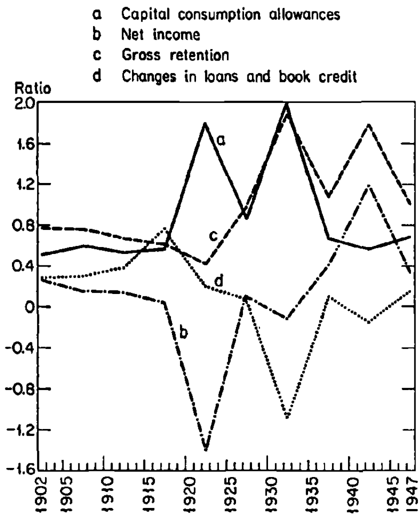
(5) Obtained by subtracting bond yields from industrial stock yields and then averaging for the business cycles indicated, terminal years being given half weight. The series on bond yields is identical with that used for col. 1 of Table 71, and the stock yield series is from the sources indicated in the notes to that table.

Financing Ratios for Selected Capital Using Sectors

Agriculture is the first sector for which we can observe fluctuations over time in the ratios of various sources of funds to capital formation (in this instance comprising not only fixed capital and inventories but also changes in cash working balances). The question to be explored is whether the proportions of various sources of funds to the total of

CHART 20

Ratios of Various Sources of Funds to Real Capital Formation Plus Cash Working Balances, Agriculture, Successive Quinquennia, 1900–1949



capital formation so financed exhibit any long swings. The relevant ratios are presented in Chart 20 and in Table 73.

One major difficulty with the data for agriculture is that they are for quinquennia—time units too long and too crude for an adequate portrayal of long swings whose duration may average not more than twenty years. But even with this qualification, the ratios in question do not change uniformly in one direction, although on balance there is a strong indication of an underlying trend. Thus, by and large, the trend in the proportion of gross retention (internal financing) to capital formation is upward, and in that of loans and book credit downward—conclusions suggested in our discussion in Chapter 5. But the

TABLE 73

RATIOS OF VARIOUS SOURCES OF FUNDS TO REAL CAPITAL FORMATION PLUS CASH WORKING BALANCES, AGRICULTURE, SUCCESSIVE QUINQUENNIA, 1900–1949

	Capital Consumption Allowances (1)	Net Income (2)	Gross Retention (1) + (2) (3)	Changes in Mortgage Credit (4)	Changes in Debt to Banks and Federal Agencies (5)	Changes in Other Debt (6)	Changes in Total Loans and Book Credit (4)+(5)+(6) (7)
1. 1900–1904	0.51	0.26	0.77	0.09	0.09	0.09	0.28
2. 1905–1909	0.60	0.16	0.76	0.10	0.10	0.10	0.30
3. 1910–1914	0.53	0.14	0.67	0.26	0.06	0.06	0.37
4. 1915–1919	0.57	0.04	0.61	0.38	0.19	0.19	0.76
5. 1920–1924	1.79	−1.38	0.41	0.59	−0.18	−0.21	0.21
6. 1925–1929	0.86	0.10	0.96	0.14	−0.03	−0.03	0.08
7. 1930–1934	2.00	−0.12	1.88	−0.08	−0.67	−0.33	−1.08
8. 1935–1939	0.67	0.41	1.08	0.01	0.08	−0.01	0.08
9. 1940–1944	0.57	1.20	1.77	−0.13	0.01	−0.03	−0.16
10. 1945–1949	0.68	0.34	1.02	0.03	0.06	0.07	0.15

Because of rounding, detail will not necessarily add to total.

SOURCE: Alvin S. Tostlebe, *Capital in Agriculture: Its Formation and Financing since 1870* (Princeton for NBER, 1957), Table 36, pp. 137 and 138. Real capital formation is the sum of fixed capital and changes in inventories.

ratio of gross retention to capital formation, which declined slightly from 1900–1904 to 1920–1924, thereafter appears to have gone through two swings with peaks in the first half of the 1930's and in the quinquennium affected by World War II. In both these periods capital formation was relatively small, and reliance on internal financing was forced either by tightness in the supply of external funds (during the depression) or by abundance of earned funds (during World War II) or by lack of need for net additions to capital.

Long swings in the ratio of gross retention to total capital formation become more prominent when we distinguish between the capital consumption and net income components of gross retention, with the ratio of capital consumption inverted to that of net income. Finally, for the proportion of external financing to capital formation we find one long swing with a peak during World War I and a trough in the early 1930's, and what appears to be the beginning of another long swing.

To be sure, the world wars and the major depression of the 1930's put their marks on the fluctuations we have been noting, through their effects on prices, on the availability of credit funds, and on the supply of capital goods. But long swings in prices, in output, and in cost and ease of credit funds existed even during the periods when there were no world wars. According to Table 73, there was an up-and-down swing in the ratio of capital consumption to capital formation even from 1900–1904 to 1910–1914. Moreover, war and threats of war, if they affect the financing ratios so profoundly and over such long periods, should not be neglected in consideration of the future.

One other point concerning the movement of the financing ratios is to be noted. The ten quinquennia covered in Table 73 permit us to observe nine changes. For real capital formation plus cash working balances, seven of these are rises and two declines. By and large, the change in the ratio of gross retention to capital formation tends to be inverted to the change in capital formation: the signs differ in six of the nine comparisons. A downward movement in capital formation brings with it a rise in the internal financing proportion, and vice versa. The opposite is true of external financing, with seven agreements in sign out of the possible nine. In other words, an upward swing in capital formation is accompanied by a rise in the external financing proportion, and a downward swing, by a decline. This is what we would expect in the course of the short-term fluctuations associated with business cycles, and there is no reason for the association to be different in the longer swings. While the data on agriculture hardly permit us to test this hypothesis thoroughly, they do suggest it; and we should refer to it in considering the other sectors.

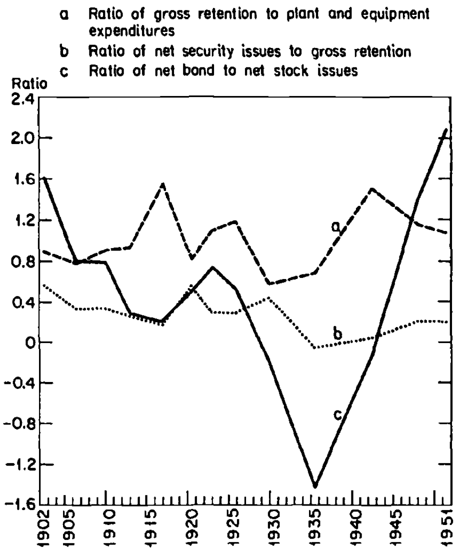
The data on financing ratios for all corporations in mining and manufacturing, which also extend back only to 1900, are somewhat better, because—though rough—they are annual, and we can calculate the averages for successive business cycles.[2] The ratios based on these averages are plotted in Chart 21 and given in Table 74. The difficulty here is that on the uses side of funds, continuous estimates are available for plant and equipment expenditures alone (excluding net changes in inventories and financial assets).

The ratio of gross retention (unadjusted for changes in inventory valuation and differences between original cost and replacement bases of capital consumption allowances) to plant and equipment expendi-

[2] Here we omit the overlapping inverted units (peak to peak) and use only the positive business cycles (trough to trough), which are sufficient to reveal the long swings.

CHART 21

Financing Ratios for Manufacturing and Mining Corporations, Successive Business Cycles, 1900–1953



tures for averages for successive business cycles (centered at the midpoint of each cycle) reveals two long swings with peaks in the two world wars. And yet other changes (as the peak in the 1920's) clearly suggest such swings even for periods without wars.

The average volume of plant and equipment expenditures by mining and manufacturing corporations, unlike the average volume of capital formation in agriculture, shows such a strong upward trend that only three of twelve changes are declines. However, if we count as a decline any change of less than a given minimum (in this case 20 per cent from cycle to cycle), we can distinguish five declines and seven rises. With this we can compare changes in the ratios of gross retention (internal financing) and of net security issues to plant and equipment expenditures.[8] In eight of the twelve changes, the movement in the ratio of gross retention is opposite to that in capital ex-

[8] The ratio of net security issues to plant and equipment expenditures is given in Daniel Creamer, Sergei Dobrovolsky, and Israel Borenstein, *Capital in Manufacturing and Mining: Its Formation and Financing* (Princeton for NBER, 1960), Table 40, p. 121; and its movement is somewhat similar to that shown in Chart 21 and Table 74 for the ratio of net security issues to gross retention.

TABLE 74

FINANCING RATIOS FOR MANUFACTURING AND MINING CORPORATIONS, SUCCESSIVE BUSINESS CYCLES, 1900–1953

Dates of Successive Business Cycles	Mid-Points of Business Cycles (1)	Gross Retention as Per Cent of Plant and Equipment Expenditures (2)	Net Security Issues as Per Cent of Gross Retention (3)	Net Bond Issues as Per Cent of Net Stock Issues (4)
1. 1900–1904	1902	89.5	57.3	160.8
2. 1904–1908	1906	77.9	32.8	79.0
3. 1908–1911	1909.5	90.2	33.0	79.1
4. 1911–1914	1912.5	92.8	24.6	27.8
5. 1914–1919	1916.5	153.7	15.6	19.0
6. 1919–1921	1920	82.4	55.7	52.4
7. 1921–1924	1922.5	108.8	29.3	73.5
8. 1924–1927	1925.5	118.3	28.9	53.4
9. 1927–1932	1929.5	57.7	44.5	−19.9
10. 1932–1938	1935	68.4	−6.2	−143.1
11. 1938–1946	1942	150.3	4.3	−12.0
12. 1946–1949	1947.5	116.6	19.8	138.9
13. 1949–1953	1951	107.5	19.2	208.0

SOURCE: Given in or calculated from Creamer, Dobrovolsky, and Borenstein, *Capital in Manufacturing and Mining*, Tables 40 and 51, pp. 121 and 162–163.

penditures; in nine of the twelve, the movement in the ratio of net security issues is positively associated with that in capital expenditures. As in agriculture, but in application to what might be called long-term financing relative to long-term capital expenditures, the long swings in internal financing ratios are negatively associated with, and the long swings in external financing ratios positively associated with, the long swings in capital formation volumes.

The data in Chart 21 and Table 74 relate to net security issues and fixed capital investment alone. But the finding of positive association between long swings in the external financing ratios and those in the volume of total uses (and negative association of the latter with long swings in the internal financing ratios) is confirmed by Dobrovolsky's analysis of the data for samples of large manufacturing corporations, for which reference cycle averages can be computed for years beginning with 1914.[4] Of eight changes in cycle-to-cycle (positive cycles only)

[4] *Ibid.*, Table M-1, pp. 454 and 455, and Table 80, p. 320.

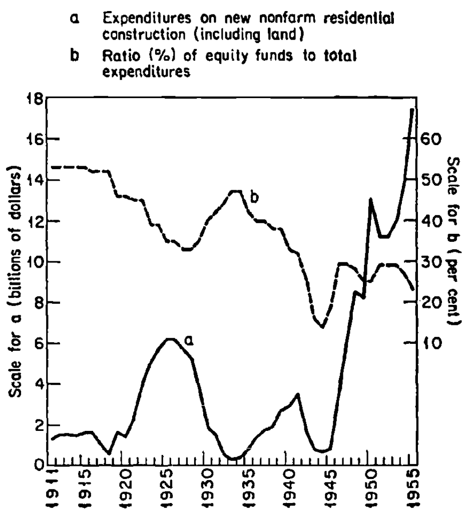
averages of annual volume of total financing, six are rises and two declines; and the changes in the ratio of external financing (short-term and long-term) to total uses are in agreement seven times out of eight. Thus, one may conclude that the associations suggested above between the long swings in external-internal financing ratios and in volumes of total financing hold not only for long-term funds relative to fixed capital investment but also for total funds relative to total financing.

Line *c* in Chart 21 (column 4 in Table 74) relates to the distribution of external financing between stocks and bonds, discussed in connection with Chart 19. The ratio of net bond issues to net stock issues reveals a long swing, roughly similar to the swing in the ratio of net security issues to either internal financing or durable capital expenditures: a drop to the World War I cycle, a rise to the 1920's, a sharp decline to the 1930's, and then another rise to the recent period. The explanation of this movement, in its connection with the industrial bond-stock-yield differentials, was suggested above.

The last sector for which we can observe long swings in the financing ratios is nonfarm residential construction. The data for Chart 22 are annual series taken directly from the Grebler, Blank, and Winnick

CHART 22

Expenditures on New Nonfarm Residential Construction Compared with Ratio of Equity Funds to Total Expenditures, Annually, 1911–1955



monograph.[5] The two series are new residential construction expenditures, and the ratio of equity funds to total expenditures. The complement of the latter ratio is, of course, the ratio of external funds (predominantly mortgages) to total expenditures, in this case, total uses (sources) of funds.

To be sure, the proportion of equity funds is an estimate based on scattered sources, and is not an exact record (in the usual sense of the word) of the flow of funds. Nevertheless, the evidence of long swings in this ratio of equity funds to total financing, combined with its generally downward trend, is quite significant. Furthermore, the swings are directly inverted to those in the volume of total expenditures—gross capital formation in this sector. During the 1920's when the long swing in nonfarm residential construction was in the up-phase, the ratio of equity funds declined and that of external financing rose; the same happened during the rise from 1933 to 1941 and during the recent rise (since World War II). By contrast, during the decline from the mid-1920's to the mid-1930's, the ratio of equity funds rose and that of external financing declined. The only exception to this inverse correlation between swings in internal financing ratios and in capital formation (or positive correlation of the latter with swings in external financing ratios) occurred during the few years of World War II, when a greatly reduced volume of nonfarm residential construction was accompanied by a decreasing ratio of equity funds and hence a rising ratio of external financing. This resulted from the special character of residential construction during those years (only housing needed for war workers being permitted), which warranted extension of credit and militated against the use of equity funds.[6]

[5] Leo Grebler, David M. Blank, and Louis Winnick, *Capital Formation in Residential Real Estate: Trends and Prospects* (Princeton for NBER, 1956).

[6] "Only during World War II, when new residential construction was limited to housing for war workers and practically all of its debt financing was under the special liberal terms for FHA-insured mortgages, did the ratio fall below 25 per cent." *Ibid.*, p. 182.