

MONTHLY  
*Business Review*

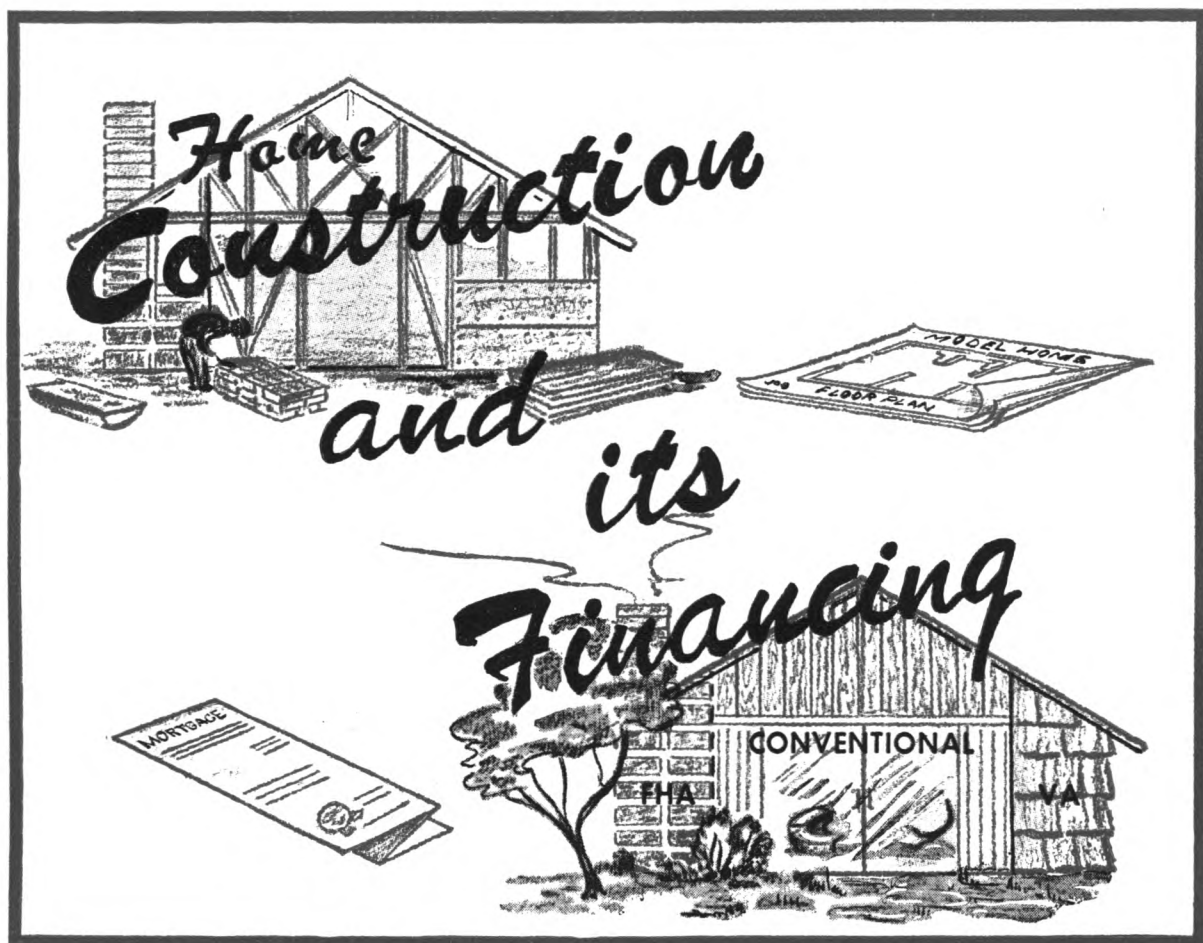
FEDERAL RESERVE BANK of CLEVELAND

*August 1961*

IN THIS ISSUE

Postwar Patterns in Homebuilding  
and Financing . . . . . 2

A Look at the Foundry Industry . . . . . 10



# Postwar Patterns In Homebuilding And Financing

AT THE TIME it became clear during 1960 that business activity was moving downward, attention was quickly directed to the sectors of the economy which might be expected to reverse, or at least cushion, the decline in business activity. The housing industry was high on the list of sectors of the economy which, it was widely held, might expand in a counter-cyclical fashion, as it had in two earlier postwar recessions. But housing did not expand. In fact, perhaps paradoxically, housing industry activity in 1960 stayed in a downtrend which had set in early in 1959. Moreover, the continued downtrend in housing activity combined with the emergence of several new demographic factors to induce apprehensions about whether residential construction would actually increase. These apprehensions were relieved to some extent by the fact that, although residential construction activity, as measured by nonfarm housing starts, continued to decline throughout most of the 1960-61 recession, such activity finally turned up as the end of the recession was approached.

As an accompanying chart shows, the most recent decline in housing starts was in marked contrast to the behavior of the series in earlier postwar recessions. Even though the recent revision of the series<sup>(1)</sup> has introduced more month-to-month fluctuation than was present in the old series, the downward path of housing starts during the 1960-61 recession is evident, in contrast to the upturns in both 1948-49 and 1953-54, and as compared with only a slight further decline

in housing starts through most of the 1957-58 recession. It can be seen from the chart that during the postwar period residential construction has moved countercyclically only in the first two of the four postwar recessions, with the impact noticeably smaller in 1953-54 than in 1948-49. Adding to this the fact that housing starts declined slightly in the 1957-58 recession and then dipped even more in the 1960-61 recession, it becomes quite apparent that the housing industry has provided progressively less of a countercyclical stimulus to the economy in each of the four postwar recessions.

When the data on housing starts for the postwar period are analyzed in terms of the type of financing, i.e., government-insured or "conventional" mortgages, it appears that there was little difference in the behavior of either type of starts in the 1957-58 and 1960-61 recessions. In 1953-54, however, starts financed by conventional mortgages declined, while starts under government programs scored a more-than-offsetting increase.

## VA and FHA Starts

The government-insured programs consist of starts underwritten by the Veterans' Administration and the Federal Housing Administration. Starts under these programs, taken together, apparently declined during the 1960-61 downturn, whereas they had registered little change during the 1957-58 recession and, as already mentioned, a sizable increase in the 1953-54 contraction. (These and the following comparisons of the behavior of housing starts by type of financing

(1) The data on housing starts were revised beginning with January 1959. For a description of the change, see the June 1960 issue of *Construction Review*, U. S. Department of Commerce.

have been made with only an approximate allowance for seasonal variation, since seasonally adjusted data are not available as of this writing.)

Looking at FHA-insured starts alone, such starts showed a very large, and an apparently greater-than-seasonal gain, during the 1948-49 recession, but increased much less during the two succeeding recessions, and declined in the 1960-61 experience. In the 1953-54 downturn, the earliest such period for which data on starts under the VA program are available, such starts showed a very sharp rise. The increase in starts during 1953-54, which contrasted with declines in VA-insured starts in the two succeeding recessions, may have been due in considerable part to the elimination of down payment requirements and other practices which allowed qualified ex-servicemen to purchase houses with no cash outlay, since closing costs could also be added to the mortgage.

The variations in the activity of the housing industry over the course of successive business cycles in the postwar period, i.e., from a counter-cyclical to a pro-cyclical influ-

ence (the latter in the 1960-61 recession) have taken place against a backdrop of a number of changes in the pattern of home financing (mortgage credit).<sup>(2)</sup> Before moving on to a discussion of changes in mortgage credit, however, there are several recent developments affecting the demand for housing which should be mentioned parenthetically, even though their full impact on housing developments cannot be evaluated precisely.

One factor which may have acted as a deterrent to residential construction in recent years, has been a steadily rising vacancy rate in rental housing units; the rental vacancy rate increased from 5.4 per 100 units in 1956 to 8.1 in the second quarter of 1961. In addition, during 1961, there has also been a slight increase in homeowner vacancy rates; these had previously shown little change.

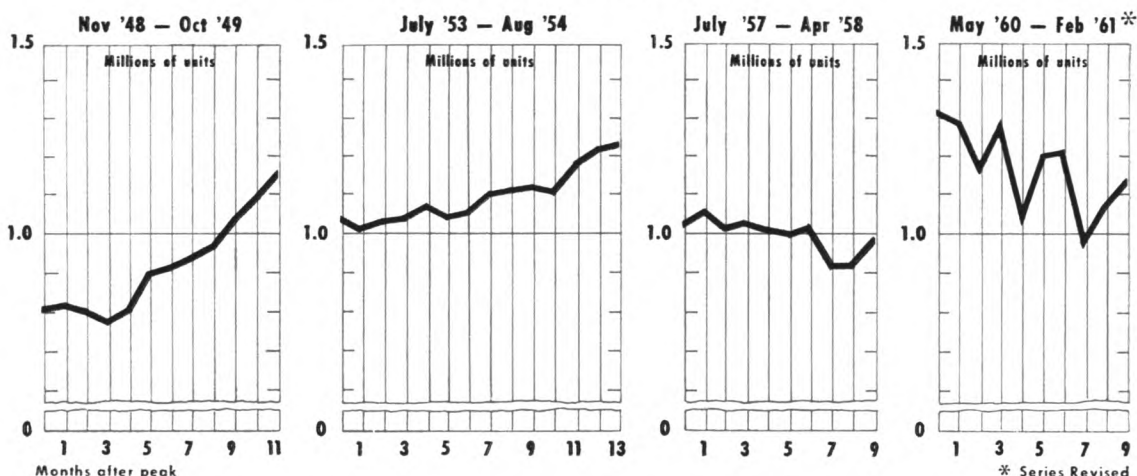
Another factor which has been advanced as a possible recent deterrent to homebuilding is

(2) The hypothesis has been advanced elsewhere that short-term changes in housing activity in the postwar period resulted from fluctuations in the supply of mortgage credit. These in turn result from changes in the demand for credit by corporations in the different phases of the business cycle. See Guttentag, J. M., "The Short Cycle in Residential Construction," *The American Economic Review*, June, 1961, pp. 275-298, *passim*.

## HOUSING STARTS IN FOUR RECESSIONS

(Private Nonfarm Units)

Seasonally Adjusted at Annual Rates



During each successive postwar recession, housing starts have had apparently less counter-cyclical influence.

the declining rate of family formations, as well as a decline in the number of married couples without their own households. If this explanation is plausible, it would follow that the housing industry might have to look ahead to several lean years until the babies born during the early postwar period, who are just now entering the labor market, reach marriageable age.

Using the preceding information on housing as a point of departure, let us consider a number of financial developments in the housing area during the postwar period. These financial developments will actually serve as a backdrop to evaluate, or partially clarify, recent experience in the housing industry. It should be understood, however, that seemingly relevant financial developments do not necessarily provide a full explanation of the possibly changing cyclical pattern of housing activity.

Regardless of the way in which it is approached, it is abundantly clear that home financing involves large dollar magnitudes. For example, the dollar volume of home mortgage debt outstanding currently amounts to more than two and one-half times as much as the volume of all other consumer debt outstanding. Looking at it another way, home mortgage lending has absorbed close to 50 percent of all long-term financing carried out in capital markets during the postwar period.

### **Insured and Conventional Mortgages**

As is widely recognized, the magnitude of government-insured mortgages has played an important role in the home mortgage market during the postwar period. In fact, as early as the end of 1948, government-insured mortgage credit represented approximately two-fifths of the amount of residential mortgage credit outstanding, as shown in the accompanying chart. Since that time, however, it is noteworthy that the relative share of government-sponsored credit in the home mortgage market has remained virtually unchanged, although of course the dollar volume has risen steadily.

The insurance underwriting activity of the Federal Housing Administration and the Veterans' Administration has introduced some degree of uniformity to the home mortgage market. Lending to home owners and/or home builders is inherently a highly individualized process owing to wide variations in the borrower's credit-worthiness and the value of the particular property. Both the FHA and VA prescribe terms within which a loan must qualify, including such things as loan maturities, interest rates, and downpayment ratios. By having a qualified loan insured or guaranteed by the FHA or VA, the investor is assured of repayment should a borrower default. In practice, both the FHA and VA programs have been oriented to new construction of medium-priced properties for borrowers in lower to medium income brackets.

Congress has recently enacted legislation which will permit the FHA to liberalize loans insured under its regular lending program (Sect. 203). The FHA has thus been granted authority to extend maximum maturities to 35 years, whereas the maximum maturity on insured loans was previously 30 years. Moreover, the maximum amount of a mortgage loan insured by the FHA has been raised from \$22,500 to \$25,000.

Turning to conventional mortgages (uninsured loans), this type of lending has continued throughout the past decade to account for the largest share of mortgage debt—about three-fifths of the amount of residential mortgage loans outstanding (as compared with the two-fifths accounted for by government-insured mortgages). Unlike government-insured loans, conventional mortgages are not standardized in quality. Rather, the latter tend to reflect to a large extent differences in the supply of local funds available for investment in home mortgages.

It is not surprising that there are widespread differences in the terms of conventional mortgages. Not only is there a wider range in the amounts of individual conventional mortgages than in government-insured mortgages, but there is also substantial vari-

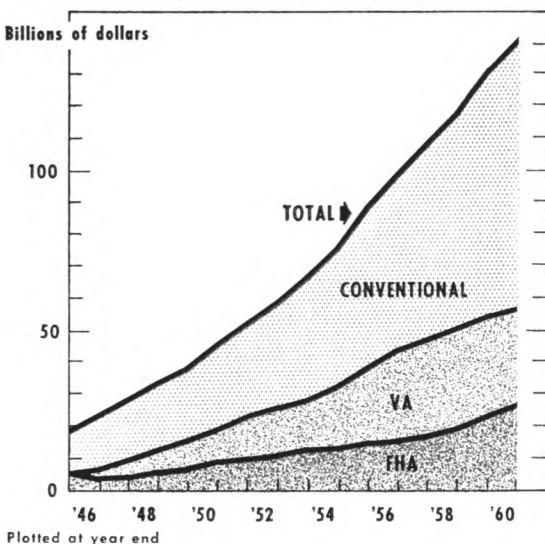
ation in interest rates, down payment requirements, and maturities. Although the terms of conventional loans tend to vary widely, such loans usually have a lower loan-to-value ratio than government-sponsored credit, i.e., a lower amount of loan relative to the value of the home. Many makers of conventional loans, such as savings and loan associations or commercial banks, are restricted by national or state regulations which impose maximum loan-to-value ratios varying from two-thirds to 85 percent of the total loan. In contrast, the FHA permits a more liberal maximum loan-to-value ratio of 95 percent.

Maturities of conventional loans also tend to be somewhat shorter than those of government-insured credit. During 1960, for example, average maturities of FHA-insured credit under the regular program were about 29 years as compared with average maturities of about 25 years on conventional loans.

The substantive difference between government-insured mortgage credit and conventional loans is due primarily to the legal framework under which the FHA and VA must operate. Because of the uniformity of FHA-insured and VA-guaranteed loans, such credit instruments have become negotiable instruments acceptable for purchase by portfolio investors. Yet the ceilings on the interest rates carried by FHA-insured and VA-guaranteed obligations (which are part of the same uniformity) have, at times, resulted in sharp fluctuations in the flow of funds into such debt instruments.

The performance of government-insured credit set a precedent for the development of a secondary market for conventional loans. During 1957, for example, the Federal Home Loan Bank Board for the first time permitted its members to hold mortgages beyond a 50-mile radius from the home office of the savings and loan association. Conventional home mortgage credit has thus tended to become somewhat more mobile, liquid, and marketable. In short, the presence of the FHA and VA in the mortgage market in recent years

## HOME MORTGAGE DEBT OUTSTANDING



*Although the volume of home mortgage debt outstanding has shown a very large and steady increase, the proportion accounted for by the different types of mortgages has remained virtually unchanged during the past decade.*

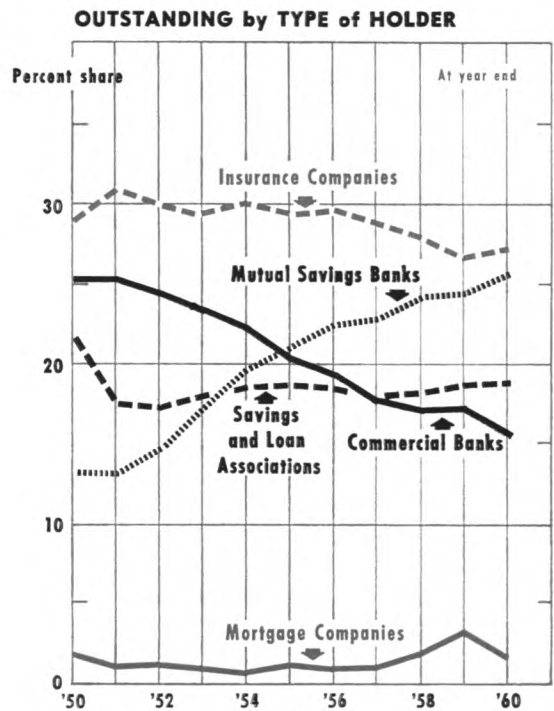
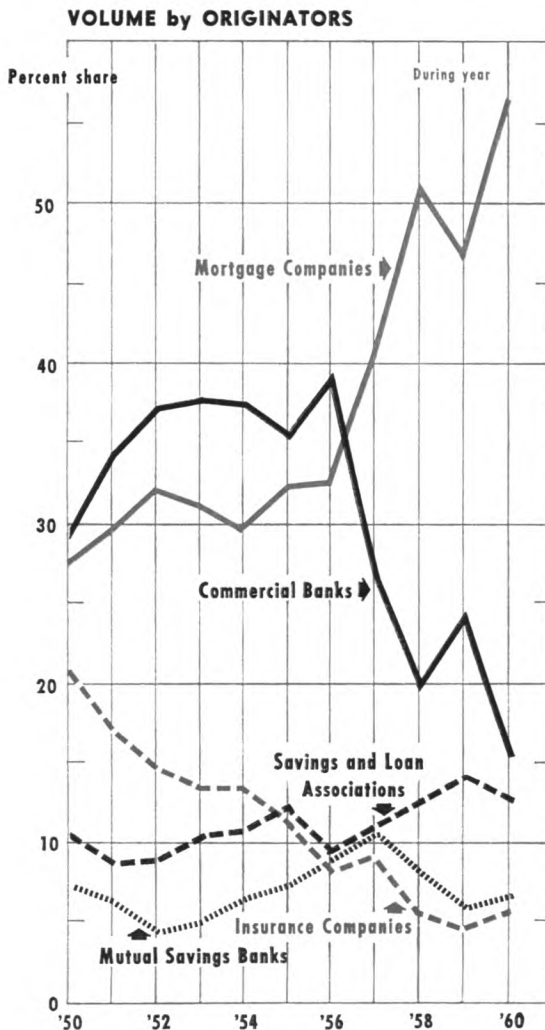
has quite clearly played a role in increasing both the supply of and demand for home mortgages.

## Lenders of Mortgage Credit

The relative amounts of mortgage debt on nonfarm one- to four-family properties held by various types of lenders have shown very little change in the postwar period. Of the major types of investors in mortgage credit, only the savings and loan associations—the largest single holder of mortgage credit—have registered an increase in the respective shares of nonfarm mortgage debt held by all types of investors. In 1946, savings and loan associations held 29 percent of such mortgage debt; at the end of 1960, these associations held approximately 40 percent of the volume outstanding.

The mortgage holdings of both life insurance companies and mutual savings banks as percentages of nonfarm mortgage debt credit outstanding have been relatively unchanged

## FHA AND VA MORTGAGES



during the postwar period. Life insurance companies held about 29 percent of nonfarm mortgage debt outstanding in 1946; at the end of 1960, such holdings accounted for 27 percent of the total. The corresponding percentages for mutual savings banks were 18 percent in 1946 and 17 percent at the end of 1960. In contrast, the share of nonfarm mortgage debt outstanding held by commercial banks declined between 1946 and 1960, from 18 percent to 14 percent.

Over and above these general developments

in the mortgage holdings of various investors, there have been discernible changes in the relative amounts of government-insured mortgages held by the major types of lenders. Most of these changes have occurred in the past few years, and can be attributed to a large extent to both the increased institutionalization of home mortgage lending and greater specialization in financing practices.

The portfolios of mutual savings banks reflect some of the changes that have taken place in the types of mortgages held by vari-

ous institutional lenders. As shown in the accompanying chart, mutual savings banks have increased their holdings of government-insured mortgage credit from 13 percent of the total outstanding in 1950 to nearly 26 percent at the end of 1960. Government-insured mortgage credit currently bulks large in the mortgage portfolios of mutual savings banks, representing nearly two-thirds of total mortgage holdings.

Life insurance companies have continued to hold the largest single share of government-insured mortgages, with 29 percent in 1950 and nearly 28 percent as of the end of 1960. Taken together, mutual savings banks and life insurance companies held more than 53 percent of the total volume of government-insured credit outstanding as of the end of 1960 (as compared with 42 percent as of the end of 1950). In addition, life insurance companies, but not mutual savings banks, are also an important holder of conventional home mortgage credit.

Government-insured mortgage credit accounts for less than one-fifth of the total mortgage loan portfolios of savings and loan associations. The fact that savings and loan associations are heavily-loaned in conventional mortgages reflects the fact that these institutions are scattered throughout the country and serve mainly the mortgage needs of their own communities. Many savings and loan associations make long-term loans to owner-builders prior to the start of construction, according to individual needs. When the house is completed or sold, the mortgage is then transferred to the purchaser.

Of all financial institutions, savings and loan associations have the highest percentage of their assets invested in mortgages. As is widely recognized, these associations have enjoyed a record savings inflow in the postwar period, which in part explains their emergence as the largest single supplier of funds to the mortgage market.

### **Mortgage Companies**

A factor which has contributed importantly to recent patterns in homebuilding and

financing is the enlarged financing operations of mortgage companies. The role played by mortgage companies explains in part the greater specialization that has evolved in mortgage credit, particularly in the financing of government-insured mortgages.

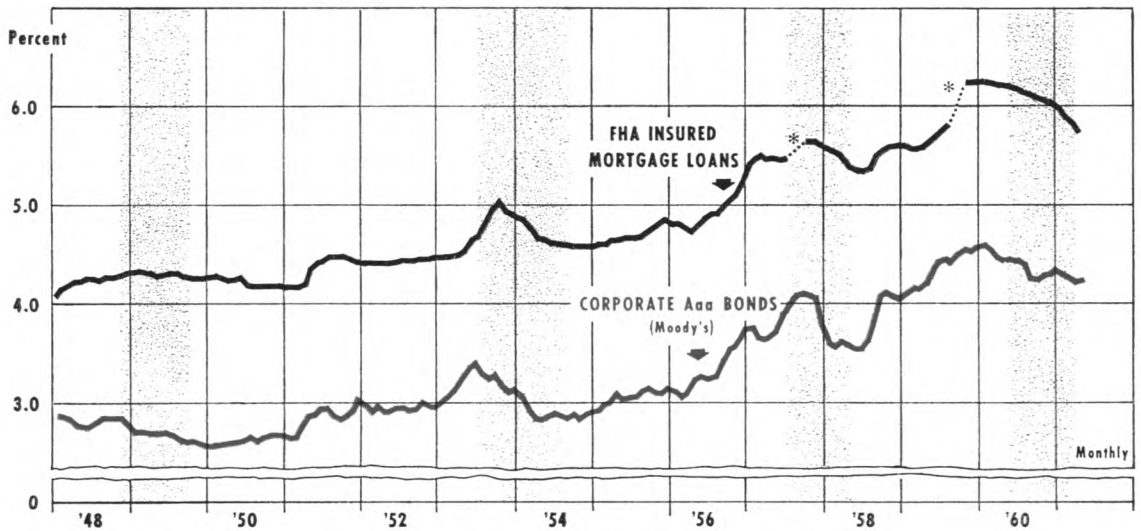
Both mutual savings banks and life insurance companies obtain government-insured loans largely from mortgage companies. As shown in the accompanying chart, mortgage companies have more than doubled their financing activity in the past decade. During 1960 these financial institutions originated nearly three-fifths of the total volume of government-insured credit. On the other hand, as shown in a previous chart, holdings of mortgage credit by mortgage companies have been nearly negligible, demonstrating quite clearly that mortgage companies operate with substantial turnover in mortgage loan portfolios.

Most of the growth in the financing activity of mortgage companies has occurred during the past five years and has accompanied a relative decline in the financing of government-insured credit by commercial banks and life insurance companies. The growth in financing activity by mortgage companies reflects in particular the emergence of the practice of "warehousing" mortgages. To illustrate, a commercial bank may make short-term loans to mortgage companies on the security of a government-insured mortgage. Individual mortgage companies can then accumulate mortgages until the volume is large enough to be sold as a unit to a large investor such as a life insurance company or a mutual savings bank.

By utilizing commercial bank credit as well as their own resources, mortgage companies are able to act as correspondents in originating and servicing mortgages for subsequent resale in large amounts to other investors.

In this way, funds from, say, the northeastern section of the country, where mutual savings banks and life insurance companies are concentrated, can be made available to capital-short sections of the country, for

## SELECTED YIELDS



\* Dotted portion of line indicates periods for which monthly data are unavailable during 1957 and 1959.

example, the Southwest. The ability of mortgage companies to originate a large share of government-insured mortgages is due in part to the secondary market operations of the Federal National Mortgage Association. The secondary market operations of FNMA are designed to enhance the liquidity of government-insured loans in the portfolios of private investors. If mortgage companies (as well as other investors) at any time are unable to find outlets for government-insured mortgages which have been newly-originated, FNMA stands ready to purchase such mortgages. In the past few years mortgage companies have accounted for about three-fourths of the total sellers of mortgages to FNMA.

### Terms of Home Mortgage Loans

To a borrower, the monthly payment on a home mortgage represents an aggregate of a number of components, the largest of which is affected by the amount and maturity of the mortgage. Variations in the contract rate of interest on home mortgages have only a minor effect on the size of the monthly pay-

ment, although they are, to be sure, an important factor affecting the total cost of purchasing a home. On FHA-insured loans there is also a 0.5 percent insurance cost on the balance of the loan outstanding. No similar charge is made by the VA since the cost of guaranteeing a mortgage is met out of general tax revenues.

An investor in mortgages is interested principally in the yield on the mortgage as compared with other capital market instruments. Data on the terms of home mortgages are limited, particularly for conventional loans. The only data regularly available on mortgage yields is a national average of prevailing discounts or premiums on home mortgages insured by FHA. Discounts or premiums are the difference between the market price and the face value of a mortgage. By offering a discount (lower) or premium (higher) price for a mortgage, lenders are able to adjust a fixed interest rate in order to obtain a specific yield.

Since 1948, the effective yield on FHA-insured mortgage credit has tended to be

about 1.5 percent greater than the yield on prime corporate bonds (Aaa) as shown in the accompanying chart. Broadly speaking, the fluctuations of corporate bond yields have been substantially greater than those of FHA-insured mortgages.

A discernible pattern in the behavior of yields on FHA-insured mortgages in the postwar period until recently has been the tendency to lag behind corporate yields during both periods of recession and expansion. To a considerable extent, both the relative narrowness of fluctuations in mortgage yields and the lag in relation to changes in capital market conditions reflect basic differences in the techniques and characteristics of mortgage markets as compared with those of other capital markets.

In the recession periods of both 1953-54 and 1957-58, mortgage yields continued to rise during the first few months of the recession

although other long-term rates had turned down. Similarly, during the 1955-56 and 1958-59 periods of expansion yields on mortgages lagged for several months behind upward moving yields on corporate bonds.

In the 1960-61 recession, however, the behavior of FHA-insured mortgage yields was markedly different from that during previous recessions in that the series not only fell during the three months prior to the recession, but fell by more than 40 basis points during the ensuing twelve-month period. Thus, the behavior of mortgage yields during 1960-61 was more akin to the behavior of corporate bonds, altering the pattern which had prevailed previously. But despite the relatively large decline in both mortgages and corporate securities, the respective yields at the trough of the recession in February 1961 were higher than those prevailing at the troughs of each of the three previous postwar recessions.

# A Look at the Foundry Industry

**M**ODERN economic society as we know it would be impossible without metals, and without the specialized metalworking processes that have been developed. One of the oldest but nonetheless still indispensable basic methods of working metal is by casting it into molds. The ability to cast metal with certain desirable properties, such as strength, hardness, machineability, and wear-resistance, into nearly any conceivable shape or form is the distinguishing feature of castings. This fundamental feature, along with technological refinements, make it possible to produce, for example, certain highly specialized castings which are required by the automotive, machinery and equipment, construction, and railroad industries. It is estimated that, altogether, nearly 4,000 different kinds of castings are produced in foundries for use in more than 500 different industries.

According to the 1958 Census of Manufactures, value added by manufacture<sup>(1)</sup> in all types of foundries in the United States amounted to approximately \$1.8 billion. Thus, foundries ranked with canned and frozen foods producers (\$1.8 billion in value added by manufacture), pharmaceutical manufacturers (\$1.9 billion), and the metalworking machinery industry (\$1.9 billion). The value added by all types of foundries represented about one-sixth of the total value added by the entire primary metal industries in 1958. According to the same source, more than 246,-

000 persons were employed in foundries during 1958. Thus, in terms of the number of persons employed, foundries ranked with manufacturers of cotton and broadwoven fabrics (245,000), organic chemicals firms (245,000), and manufacturers of household furniture (253,000). The number of persons employed in all types of foundries represented slightly more than one-fifth of the total of persons employed in the primary metal industries in 1958.

About three-fourths of foundry production in 1958 was turned out at "independent" foundries, according to available data on the value of shipments in that year.<sup>(2)</sup> Independent foundries are those which produce castings for buyers in the open market on a contract basis, in contrast to "captive" foundries which are integrated with other manufacturing industries. Some of the larger independent foundries concentrate their output on standardized items. Others, particularly the smaller independent foundries, produce a wide variety of castings to satisfy the many customers who require a few special types of castings.

About one-fourth of foundry output in 1958 was produced at "captive" plants, which also range from small to large operations. Regardless of size, the castings of captive foundries tend to be somewhat standardized

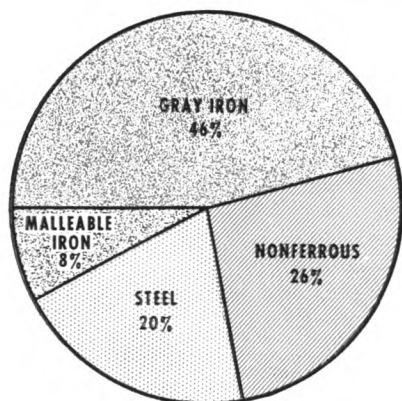
(1) "Value added by manufacture" is approximately equivalent to the sum of profits, wages, and taxes. As defined by the 1958 Census of Manufacturers, "value added by manufacture" is computed by subtracting the cost of materials, fuel, purchased electric energy, and contract work from the value of shipments of manufacturered products plus receipts from services rendered. In addition, adjustments are made for inventory changes and merchandising operations.

(2) According to the 1958 Census of Manufactures, approximately one-fourth of the total value of shipments of all ferrous castings was classified as "captive." However, data in regard to captive and independent nonferrous foundries are not complete in that part of the 1958 Census of Manufactures which has been published at the time of the writing of this article. Nevertheless, estimating from data in the 1954 Census of Manufactures and incomplete data from the 1958 Census of Manufactures, it is likely that at least one-fourth of the total shipments from nonferrous foundries could be classified as "captive."

## THE IMPORTANCE of VARIOUS TYPES of FOUNDRIES

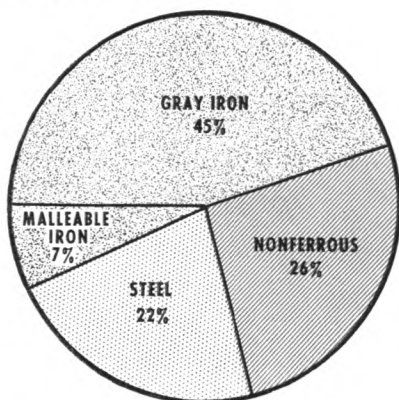
### EMPLOYMENT

Percent of Total Employment  
in Foundries shown for each  
of the Four Major Classifications  
of Foundries



### VALUE ADDED BY MANUFACTURE

Percent of Total Value Added  
by Manufacture in Foundries  
for each of the Four Major  
Classifications of Foundries



Source: 1958 Census of Manufactures.

since they are usually produced for a single manufacturer. However, when excess capacity is available, captive foundries may also produce for the open market.

## Classification of Foundries

Foundries are customarily classified according to the metal used in the manufacture of castings. Of the many varieties and alloys of metals employed, the most common ferrous metals are gray iron, malleable iron, and steel. The major nonferrous metals used in castings are aluminum, magnesium, and the copper-base alloys such as brass and bronze.

Gray iron foundries bulk largest among all types of foundries, whether the number of employees or value added by manufacture is used as the basis of comparison. In 1958, as shown in the accompanying table, gray iron foundries accounted for 46 percent of the total number of employees and 45 percent of the total value added by manufacture in all types of foundries.

Nonferrous foundries as a group constitute the second largest part of the foundry industry. In 1958, such foundries accounted for 26 percent of the total number of employees and 26 percent of the total value added by manufacture in all types of foundries.

Ranking third in importance among all types of foundries are steel foundries, which in 1958 accounted for 20 percent of the total number of employees and 22 percent of the total value added by manufacture in all types of foundries.

Malleable iron foundries comprise the smallest segment of the foundry industry. In 1958, such foundries accounted for 8 percent of the total number of employees and 7 percent of the total value added by manufacture in all types of foundries.

## Foundry Products

The foundry industry as a whole is called upon to provide a wide variety of metal products. The industry is an important supplier to a wide range of industries, as shown in the accompanying table. Some of the more common items produced by the foundry industry are grouped below, according to the kind of metal used. It will be observed that castings

are generally used as components of larger and more complex products.

*Gray Iron Foundries.* Gray iron castings are used when there is a need for a heat-resistant product which does not have to withstand stress or strain. Examples of gray iron castings are:

Engine blocks for automobiles and trucks  
 Brake drums for " " "  
 Clutch plates for " " "  
 Flywheels for engines  
 Housings for power units on road machinery equipment  
 Parts for turbines used in electric generating stations  
 Frames for lathes and boring mills

*Nonferrous Foundries.* Aluminum castings, which comprise the major part of all nonferrous castings, are used when a lightweight casting is required. A few of the uses of aluminum castings are:

Aircraft engine parts  
 Motor blocks for automobiles  
 Oil pans for automobiles  
 Entrances and window frames for buildings  
 Cylinder heads for automobile and truck engines

The principal other nonferrous metals which are used in castings are copper base alloys and magnesium. Copper base alloy castings (commonly referred to as brass or bronze castings) contain copper together with tin, lead, or zinc. Because brass and bronze castings do not rust or corrode readily, such castings are used primarily for plumbing fittings, marine fittings and other hardware, bushings, and bearings.

Although magnesium castings are not quite as strong as aluminum castings, the former have the advantage of being approximately one-third lighter in weight than similar aluminum castings. However, magnesium castings are combustible and must be used only in places where there is little likelihood of fire or high temperatures. One of the uses of magnesium castings is special hardware for aircraft.

## THE USES OF CASTINGS

GRAY IRON CASTINGS	Est. % of Total
1. Automotive (including replacement).....	26%
2. Building and construction	10
3. Utilities.....	9
4. Machine tool equipment.	8
5. Agricultural equipment..	7
Other uses.....	40
	100%

ALUMINUM AND ALUMINUM BASE ALLOY CASTINGS	
1. Motor vehicles and parts.	51%
2. Internal combustion engines, motors and generators.....	15
3. Aircraft industry.....	14
4. Domestic laundry equipment and electrical appliances.....	12
5. Valves and fittings.....	5
Other uses.....	3
	100%

STEEL CASTINGS	
1. Railroad equipment.....	33%
2. Construction machinery and equipment.....	15
3. Rolling mill equipment..	14
4. Mining and crushing machinery.....	6
5. Motor vehicles.....	5
Other uses.....	27
	100%

MALLEABLE IRON CASTINGS	
1. Automobiles and trucks..	51%
2. Agricultural implements.	11
3. Plumber's valves and fittings.....	10
4. Valves and fittings (other than plumbing)..	9
5. Construction and mining machinery.....	4
Other uses.....	15
	100%

The data used here are the most recent complete figures available. They are taken from the reports of the Gray Iron Founders' Society (1954), the Steel Founders' Society of America (1960), and the Malleable Founders' Society (1959). The data on aluminum castings are from the 1954 Census of Manufactures. These data are used to shed some light on the uses of castings. Foundry industry sources indicate that such data are representative of the relative shares of castings that are currently being consumed.

*Steel Foundries.* Steel castings are used in the manufacture of products when a high degree of strength in a compact place or resistance to shock is a requirement. Examples of the uses of steel castings are:

- Locomotive truck frames
- Railroad car wheels
- Railroad freight car beds (up to 70 feet in length)
- Bases for power shovels used in construction machinery
- Front and rear axle housings used in trucks

*Malleable Iron Foundries.* Castings of malleable iron are used in the manufacture of products when there is a need for a metal casting that can withstand a moderate amount of stress and strain, but which does not have to withstand shock or abrasive wear. Although gray iron castings and malleable iron castings are both made from pig iron and scrap iron, malleable iron castings are specially treated to lower and control the carbon and silicon content. Malleable iron castings are used for products such as:

- Rear axle housings for automobiles and trucks
- Universal joint yokes for     "     "     "
- Crankshafts for             "     "     "
- Frame members for trucks
- Guards for agricultural mowing machines
- Inner and outer shoes for holding agricultural attachments to a tractor

## Location of Foundries

Foundry activity is concentrated in a comparatively small number of states. Three states—Ohio, Michigan and Pennsylvania—accounted for more than two-fifths of the total value added by manufacture in all foundries in the United States, according to the 1958 Census of Manufactures. Another one-fifth of the total value added by manufacture in all foundries in the United States was accounted for by three additional states, Illinois, Indiana, and Wisconsin. These six states tend to form a region which coincides rough-

ly with many of the major iron and steel producing areas of the United States.

The state of Ohio ranked first in foundry activity among all states in 1958. Total value added by manufacture among all types of foundries in Ohio amounted to more than \$279 million and accounted for approximately 16 percent of the total value added by manufacture in all types of foundries in the United States. Gray iron and nonferrous foundries predominate in Ohio, and, when combined, accounted for about three-fourths of the total value added by manufacture in all types of foundries in Ohio during 1958.

Michigan ranked second in foundry activity in 1958. Total value added by manufacture among all types of foundries in Michigan amounted to more than \$257 million and accounted for approximately 14 percent of the total value added by manufacture in all types of foundries in the United States. Foundry activity in Michigan was mainly concentrated in gray iron foundries and nonferrous foundries. Gray iron and nonferrous foundries, taken together, accounted for approximately five-sixths of the total value added by manufacture in all types of foundries in Michigan during 1958.

In Pennsylvania, the third-ranking state in foundry activity, total value added by manufacture among all foundries amounted to more than \$196 million and accounted for about 11 percent of the total value added by manufacture among all types of foundries in the United States. It is noteworthy that steel foundries in Pennsylvania, which ranked first by a wide margin among all states in value added by manufacture, accounted for more than two-fifths of the total value added in all types of foundries in Pennsylvania. Gray iron foundries accounted for an additional one-fourth of the total value added by manufacture among all types of Pennsylvania foundries.

*Concentration of Various Classifications of Foundries.* Malleable iron foundries are concentrated within a small number of states. Taken together, Illinois, Michigan, and Ohio accounted for more than 60 percent of the

## LEADING STATES

(Value Added by Manufacture in Foundries)

ALL TYPES OF FOUNDRIES*			STEEL FOUNDRIES		
		Est. % of Total			Est. % of Total
1. Ohio.....	\$ 279,099,000	16%	1. Pennsylvania.....	\$ 83,025,000	22%
2. Michigan.....	257,477,000	14	2. Ohio.....	48,509,000	13
3. Pennsylvania.....	196,333,000	11	3. Illinois.....	39,207,000	10
4. Illinois.....	162,337,000	9	4. Indiana.....	36,783,000	9
5. Indiana.....	103,507,000	6	5. Wisconsin.....	30,557,000	8
6. Wisconsin.....	95,956,000	5	6. Michigan.....	14,946,000	4
Total of Leading			7. Oregon.....	9,463,000	2
Six States.....	1,094,709,000	61%	All Other States.....	121,380,000	32
All Other States.....	698,252,000	39	Total.....	\$ 383,870,000	100%
Total U.S.....	\$1,792,961,000	100%			
<b>GRAY IRON FOUNDRIES</b>			<b>MALLEABLE IRON FOUNDRIES</b>		
1. Michigan.....	\$ 145,475,000	18%	1. Illinois.....	\$ 31,300,000	24%
2. Ohio.....	134,681,000	16	2. Michigan.....	28,005,000	22
3. Pennsylvania.....	53,709,000	7	3. Ohio.....	19,835,000	16
4. Indiana.....	45,529,000	6	4. Pennsylvania.....	12,637,000	10
5. New Jersey.....	40,665,000	5	5. Wisconsin.....	9,345,000	7
6. Illinois.....	39,732,000	5	6. Indiana.....	5,907,000	5
7. Wisconsin.....	35,682,000	4	7. Connecticut.....	2,834,000	2
All Other States.....	315,285,000	39	All Other States.....	17,729,000	14
Total.....	\$ 810,758,000	100%	Total.....	\$ 127,592,000	100%
<b>NONFERROUS FOUNDRIES</b>					
1. Ohio.....	\$ 76,074,000	16%			
2. Michigan.....	69,051,000	15			
3. Illinois.....	52,098,000	11			
4. California.....	50,207,000	11			
5. New York.....	38,775,000	8			
6. Pennsylvania.....	36,962,000	8**			
7. Wisconsin.....	20,372,000	4			
All Other States.....	127,202,000	27			
Total.....	\$ 470,741,000	100%			

\* Complete data for all types of foundries are available only for the leading six states. Data for nonferrous foundries in the state of Indiana are not shown in this table.

\*\* Data are available only for certain classifications of nonferrous castings in the state of Pennsylvania (i. e., aluminum, brass, bronze and copper castings).

Source: 1958 Census of Manufactures.

total value added by manufacture in all malleable iron foundries in 1958. These three states, plus Pennsylvania, Wisconsin, Indiana, and Connecticut, contributed altogether 86 percent of the total value added by manufacture in all malleable iron foundries.

Steel foundries also are concentrated in a small number of states. Three states, Pennsylvania, Ohio and Illinois, accounted for 45 percent of all value added by manufacture in steel foundries in 1958. These three states,

plus Indiana, Wisconsin, Michigan, and Oregon, contributed nearly 70 percent of all value added by manufacture in steel foundries. (In addition, nonferrous and gray iron foundries are concentrated within a few states, as is shown in the accompanying table.)

### An "Average" Foundry

Due to the diversity of the size and the output of various classifications of foundries,

it is somewhat difficult to derive an "average" foundry.<sup>(3)</sup> However, such a derivation may be helpful in obtaining some bench-mark information on the basis of which an "average" individual foundry may be compared with an "average" firm in other industries.

Using data from the 1958 Census of Manufactures, it has been found that an average foundry in the United States employed 68 persons in 1958, thus representing, within the confines of the iron and steel industry, a small establishment. By way of comparison, establishments which manufactured iron and steel forgings employed, on average, 121 persons in 1958, while an average of 1,757 persons were employed in blast furnaces, steel works, and rolling mills.

Malleable iron foundries, on average, tended to be the largest in size among the various types of foundries in the United States in 1958. The output of a representative malleable iron foundry, as measured, for example, by value of shipments, amounted to nearly two and one-half times as much as did the

average output of all types of foundries in the United States.

On the other hand, the nonferrous foundries tended to be the smallest in size among all types of foundries in 1958. An average nonferrous foundry employed less than one-half as many persons as did the other types of foundries in the United States. The output of an average nonferrous foundry, as measured by value of shipments, was approximately one-half as large as the average output of all foundries in the United States.

The wide variation in the characteristics of foundries is emphasized even more when a malleable iron foundry is compared with a nonferrous foundry. On average, malleable iron foundries employed more than seven times as many persons as did the nonferrous foundries. Moreover, on average, output from a representative malleable iron foundry was more than five times as large as that of a representative nonferrous foundry.

---

(3) "Average" refers to an ordinary arithmetic mean. It is fully recognized that there are substantial variations around the average. Accordingly, averages as used here are intended to serve only as a broad gauge of the foundry industry.



FOURTH FEDERAL RESERVE DISTRICT