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## APPENDIX L

### DERIVATION OF THE AGGREGATE MORTGAGE SERIES

THE annual series of the nonfarm residential mortgage debt presented in this study is essentially based upon Raymond Goldsmith's mortgage estimates in his *A Study of Saving in the United States*, but modified by two major revisions:

1. The most important alteration of Goldsmith's series involves the pre-1925 data. Goldsmith's basic sources for this period are the 1890 and 1920 censuses of owner-occupied mortgaged dwellings. He expanded the aggregate mortgage debt on this portion of the housing inventory to a nonfarm total by using four relationships between tenant-occupied and owner-occupied housing. These relationships are (a) the ratio of the number of mortgaged tenant-occupied units to the number of mortgaged owner-occupied dwelling units; (b) the ratio of the average values of tenant-occupied and owner-occupied housing; (c) the ratio of the proportion of tenant-occupied dwellings with mortgages to the proportion of owner-occupied dwellings with mortgages; and (d) the relationship between the debt-to-value ratio of tenant-occupied dwellings and that of owner-occupied dwellings.

The last three relationships, which were obtained from Wickens' *Residential Real Estate*, the 1940 *Census of Housing*, and the 1948 *Survey of Consumer Finances*, were considered acceptable for this study. An error, however, was found in the use of the first relationship. The use of an expansion factor based on the ratio of the number of tenant-occupied to owner-occupied *dwelling units* overlooks the fact that both the 1890 and 1920 mortgage censuses reported mortgage debt on owner-occupied *structures*. Since many owner-occupied structures contain one or more rented dwelling units, the aggregate mortgage debt of the owner-occupied portion of the inventory reported in 1890 and 1920 includes a large number of tenant-occupied units. Thus Goldsmith's estimate of mortgage debt on rental units involves some double counting.

The probable magnitude of the error and a corresponding correction factor could be ascertained from the 1940 *Census of Housing*, which presented a tabulation of tenant- and owner-occupied dwelling units by type of structure. In that year the number of dwelling units in owner-occupied structures was 22 per cent greater than the number of units actually occupied by owners, i.e. owner-occupied structures contained 50 per cent of all dwelling units as compared with a tenure ratio of 41 per cent. This correction factor reduced Goldsmith's 1920 estimate

from \$10,025,000,000 to \$9,120,000,000 and his 1890 estimate from \$2,733,000,000 to \$2,292,000,000. Indirect evidence indicates that the correction was in the right direction. First, Goldsmith's test expansion of the 1940 census mortgage data on one- to four-family owner-occupied dwellings by the use of an unadjusted tenure ratio produced an aggregate one- to four-family mortgage debt \$3.7 billion higher than the Federal Home Loan Bank Board estimate. When the adjusted tenure ratio was substituted, the derived total compared quite closely with the FHLBB series. Second, the lowered 1920 estimate resulted in a movement in the residential mortgage debt between 1920 and 1925 more related to the movement in the total nonfarm mortgage debt. Use of Goldsmith's 1920 estimate would have led to a falling ratio of residential to total mortgage debt between 1920 and 1925, an unlikely result in view of the rising ratio of residential to total construction during this period, and to a suspiciously low 1920-1925 increment of residential debt.

There is considerable doubt about the reliability of the second estimating ratio, the relationship between the average values of a mortgaged tenant-occupied dwelling unit and a mortgaged owner-occupied structure, particularly for 1890. On the assumption that the relative differences in value between the two tenure classes were smaller before the turn of the century than in later decades, Goldsmith uses a 90 per cent ratio in 1890 compared with a 75 per cent ratio in 1920. The evidence seems to indicate that the reverse was true.

The average value of an owner-occupied mortgaged structure increased by about 52 per cent between 1890 and 1920 while costs of construction rose by 130 per cent. This suggests that the incidence of mortgage indebtedness was extending further down the house value distribution. That is, the typical owner-occupied mortgaged structure in 1890 was further above the average in 1890 than it was in 1920. Ely points out that in a sample of twenty-six large cities there were, relatively, twice as many mortgaged homes having a value over \$25,000 in 1890 as in 1920, notwithstanding the enormous rise in price levels.<sup>1</sup> Elsewhere in his monograph (page 53), Ely states, "If the increase in building costs as calculated by reputable statisticians is correct, the average mortgaged home [in 1920] is a smaller home than the average mortgaged home in 1890 [and] bears out the assumption that there has been a new class of home owners developing since 1890."

Thus the 1890 value ratio used by Goldsmith appears to be a significant overstatement and leads to an unduly large residential

<sup>1</sup> *Mortgages on Homes in the United States, 1920*, Bureau of the Census, Census Monographs II, 1923, pp. 120-121.

mortgage debt estimate for 1890. But no estimate of the magnitude of error could be ascertained and no adjustment was attempted.

2. A second difference between Goldsmith's residential mortgage debt series and the one presented here arises from changes in official series—especially the FHLBB revision of its 1925-1953 estimates of the mortgage debt on one- to four-family homes—which were published after Goldsmith's tables had been completed. These changes affect not only the aggregate debt series but the distribution by type of holder as well. The latter changes are noted in Appendix N. Other, minor revisions are listed in notes to the tables.

The residential mortgage debt series is intended to represent the aggregate indebtedness on residential real estate regardless of the priority of the mortgage or type of residential structure. However, there is reason to believe that mortgages on nonhousekeeping residential real estate, such as transient hotels, are usually classified as nonresidential.<sup>2</sup> On the other hand, mortgage loans on housekeeping residential real estate include those on property predominantly residential but including stores or other commercial facilities.

As the notes to the tables indicate, the compilation of a sixty-year annual mortgage debt series entails the frequent substitution of assumptions for facts and considerable interpolation. The residential mortgage debt series is especially weak for the pre-1925 period, based as it is upon the two widely separated mortgage censuses of 1890 and 1920 and on the movement of total nonfarm debt, itself an inadequate series. From 1925 on the Federal Home Loan Bank Board estimates of mortgage debt on one- to four-family homes provide a more satisfactory basis for the aggregate series. However, the estimates of mortgage debt on multi-family dwellings and especially of real estate bonds are of a lower quality even for more recent decades. For the earlier decades the series reflects approximate levels and underlying trends rather than accurate annual movements.

<sup>2</sup> See the instructions given in Schedule A-3 of the May 1950 Call Report issued by the Board of Governors of the Federal Reserve System.

TABLE L-1  
 Total Nonfarm Mortgage Debt and Total Nonfarm Residential  
 Mortgage Debt, Excluding Real Estate Bonds, 1890-1952  
 (dollars in millions)

	<i>Total Nonfarm Mortgage Debt (1)</i>	<i>Total Nonfarm Residential Mortgage Debt (2)</i>	<i>Ratio of Column 2 to Column 1 (3)</i>
1890	\$ 3,811	\$ 2,292	.6014
1896	4,400	2,711	.6161
1897	4,439	2,746	.6185
1898	4,483	2,783	.6209
1899	4,547	2,835	.6234
1900	4,661	2,917	.6258
1901	4,793	3,011	.6283
1902	4,918	3,102	.6307
1903	5,045	3,194	.6332
1904	5,256	3,341	.6356
1905	5,517	3,520	.6380
1906	5,739	3,676	.6405
1907	5,903	3,795	.6429
1908	6,117	3,948	.6454
1909	6,434	4,168	.6478
1910	6,806	4,426	.6503
1911	7,115	4,644	.6527
1912	7,451	4,881	.6551
1913	8,103	5,329	.6576
1914	8,672	5,724	.6600
1915	9,075	6,012	.6625
1916	9,606	6,387	.6649
1917	10,612	7,082	.6674
1918	11,058	7,407	.6698
1919	11,617	7,809	.6722
1920	13,516	9,120	.6748
1921	14,744	10,017	.6794
1922	16,197	11,080	.6841
1923	18,766	12,924	.6887
1924	21,335	14,794	.6934
1925	24,684	17,231	.6981
1926	27,823	19,956	.7172
1927	31,042	22,491	.7245
1928	34,319	24,958	.7272
1929	36,851	27,001	.7327
1930	37,726	27,649	.7329
1931	36,511	26,673	.7305
1932	34,362	24,918	.7252
1933	30,466	23,083	.7577
1934	29,486	22,811	.7736

(continued on next page)

TABLE L-1 (continued)  
(dollars in millions)

	Total Nonfarm Mortgage Debt (1)	Total Nonfarm Residential Mortgage Debt (2)	Ratio of Column 2 to Column 1 (3)
1935	\$28,415	\$22,211	.7817
1936	28,046	21,915	.7814
1937	27,995	21,924	.7831
1938	28,218	22,046	.7813
1939	28,930	22,740	.7868
1940	29,986	23,810	.7940
1941	31,250	24,875	.7960
1942	30,771	24,667	.8016
1943	29,906	24,056	.8044
1944	29,744	24,000	.8069
1945	30,792	24,643	.8003
1946	36,879	29,459	.7988
1947	43,853	35,061	.7995
1948	50,904	40,861	.8027
1949	57,077	45,896	.8041
1950	66,733	54,362	.8146
1951	75,555	62,026	.8209
1952 <sup>p</sup>	83,740	69,121	.8254

<sup>p</sup> Preliminary.

Column

Source

- 1 The total nonfarm mortgage debt series is taken from Raymond W. Goldsmith, *A Study of Saving in the United States*, Princeton University Press, 1955, Vol. I, Tables R-34 and R-35, with the exceptions noted below. Goldsmith's work should therefore be consulted for the details of the derivation. Only a general summary is given here.
- 1890: From *Census of the United States, 1890, Real Estate Mortgages*, Bureau of the Census. The total represents mortgages on lots, assumed to be equivalent to nonfarm real estate. Railroad and public utility mortgage indebtedness was excluded. The census obtained the essential data from mortgage recordings in public registers. In order to adjust to an outstanding balance basis, the Census Bureau conducted surveys in a number of sample counties, which involved personal interviews, and mailed questionnaires to mortgagors and mortgagees to determine the average ratio of repayments and the average duration of loans. Goldsmith's downward revision of this estimate by 10 per cent does not seem warranted and has not been followed. The annual values between 1890 and 1912, which are derived by interpolation, will therefore differ from Goldsmith's series for the same period.
- 1916-1928: From *Survey of Current Business*, Dept. of Commerce, September 1946. Goldsmith's series, however, reflects a later, but not the latest, revision of the one- to four-family mortgage series and hence differs from the Commerce Department series. For the period 1916-1928, furthermore, Goldsmith stepped up the Commerce series to allow for mortgage debt of corporate borrowers, which Commerce reports separately.
- (notes continued on next page)

## Notes to Table L-1 (continued)

Column	Source
	<p>rately only for years since 1929. The 1912 estimate is taken as a ratio to the adjusted 1922 Commerce estimate. The ratio is derived from the 1912 and 1922 estimates of nonfarm mortgage debt given by Donald Horton in <i>Long-Term Debts in the United States</i> (Dept. of Commerce, 1937). The 1913-1915 estimates are interpolated between 1912 and 1916 with reference to the movements in Kuvin's series for those years (see Leonard Kuvin, <i>Private Long-Term Debt and Interest in the United States</i>, National Industrial Conference Board, 1936, p. 36).  1929-1952: From <i>Survey of Current Business</i>, Dept. of Commerce, September 1953, p. 18.</p>
2	<p>1890-1920: Based on Goldsmith's residential mortgage debt estimates for 1890 and 1920 (<i>op. cit.</i>, Vol. I, Table R-40), corrected, however, for the double-counting error discussed earlier in this appendix. The annual estimates between 1890 and 1920 are derived, following Goldsmith's procedure, by interpolating the ratios of nonfarm residential to total nonfarm mortgage debt between the ratios derived for the two benchmark years. The differences in the bench-mark estimates between the values presented here and those given by Goldsmith produce differences, of course, in the interpolated values.  1921-1924: Estimates taken directly from Goldsmith, <i>op. cit.</i>, Vol. I, Table R-34. They were derived by interpolation between the 1920 estimate and the 1925 estimate. The latter estimate, except for mortgages on multi-family dwellings, is based on the Federal Home Loan Bank Board series, which starts in 1925.  1925-1952: The sum of columns 1 and 2 in Table L-4.</p>

TABLE L-2  
 Total Real Estate Bonds and Residential  
 Real Estate Bonds Outstanding, 1890-1952  
 (millions of dollars)

	Total (1)	Residential (2)		Total (1)	Residential (2)
1890	..	..	1924	1,800	720
1896	15	..	1925	2,905	1,162
1897	20	..	1926	3,861	1,544
1898	25	..	1927	4,668	1,867
1899	30	..	1928	5,699	2,280
1900	35	..	1929	6,098	2,439
1901	40	..	1930	6,318	2,527
1902	45	..	1931	6,500	2,600
1903	50	..	1932	6,300	2,520
1904	55	..	1933	5,952	2,381
1905	60	..	1934	5,000	2,000
1906	65	..	1935	4,200	1,680
1907	70	..	1936	3,800	1,520
1908	80	..	1937	3,400	1,360
1909	90	..	1938	3,200	1,280
1910	100	40	1939	3,000	1,200
1911	115	46	1940	2,800	1,120
1912	130	52	1941	2,600	1,040
1913	150	60	1942	2,450	980
1914	190	76	1943	2,250	900
1915	230	92	1944	2,050	820
1916	270	108	1945	1,850	740
1917	320	128	1946	1,700	680
1918	370	148	1947	1,600	640
1919	472	189	1948	1,500	600
1920	584	234	1949	1,400	560
1921	640	256	1950	1,300	520
1922	903	361	1951	1,200	480
1923	1,306	522	1952	1,100	440

## Column

## Source

- 1 The estimates of real estate bonds outstanding are taken directly from Raymond W. Goldsmith, *A Study of Saving in the United States*, Princeton University Press, 1955, Vol. I, Table R-41. The data upon which the series is based are quite fragmentary and represent orders of magnitude rather than precise totals, but the importance of real estate bond issues, particularly during the twenties, makes inclusion of the series necessary. The series of total bonds outstanding was constructed by Goldsmith with extensive recourse to extrapolation for the pre-1913 and post-1934 periods, and interpolations for the 1914-1919 period. Furthermore, Goldsmith found it necessary to adjust the basic 1920-1934 data in order to link the estimates of different investigators. The 1950-1952 estimates were added to the series by extending Goldsmith's 1946-1949 extrapolation.
- 2 The estimates are those by Goldsmith (*ibid.*, Vol. I, Table R-43). The residential component of outstanding real estate bonds is taken as 40 per cent throughout the period. The extension to 1952 was made by applying the same ratio. For the period before 1910 it was assumed that there were no residential real estate bonds outstanding.

TABLE L-3  
 Total Nonfarm Mortgage Debt and Total Nonfarm Residential  
 Mortgage Debt, Including Real Estate Bonds, 1890-1952  
 (dollars in millions)

	<i>Total Nonfarm Mortgage Debt (1)</i>	<i>Total Nonfarm Residential Mortgage Debt (2)</i>	<i>Ratio of Column 2 to Column 1 (3)</i>
1890	\$ 3,811	\$ 2,292	.6014
1896	4,415	2,711	.6140
1897	4,459	2,746	.6158
1898	4,508	2,783	.6173
1899	4,577	2,835	.6194
1900	4,696	2,917	.6211
1901	4,833	3,011	.6230
1902	4,963	3,102	.6250
1903	5,095	3,194	.6268
1904	5,311	3,341	.6290
1905	5,577	3,520	.6311
1906	5,804	3,676	.6333
1907	5,973	3,795	.6353
1908	6,197	3,948	.6370
1909	6,524	4,168	.6388
1910	6,906	4,466	.6466
1911	7,230	4,690	.6486
1912	7,581	4,933	.6507
1913	8,253	5,389	.6529
1914	8,862	5,800	.6544
1915	9,305	6,104	.6559
1916	9,876	6,495	.6576
1917	10,932	7,210	.6595
1918	11,428	7,555	.6610
1919	12,089	7,998	.6615
1920	14,100	9,354	.6634
1921	15,384	10,273	.6678
1922	17,100	11,441	.6691
1923	20,072	13,446	.6699
1924	23,135	15,514	.6706
1925	27,589	18,393	.6667
1926	31,684	21,500	.6786
1927	35,710	24,358	.6821
1928	40,018	27,238	.6806
1929	42,949	29,440	.6855
1930	44,044	30,176	.6851
1931	43,011	29,293	.6811
1932	40,662	27,438	.6748
1933	36,418	25,464	.6992
1934	34,486	24,811	.7195

(continued on next page)

TABLE L-3 (continued)  
(dollars in millions)

	<i>Total Nonfarm Mortgage Debt (1)</i>	<i>Total Nonfarm Residential Mortgage Debt (2)</i>	<i>Ratio of Column 2 to Column 1 (3)</i>
1935	\$32,615	\$23,891	.7325
1936	31,846	23,435	.7359
1937	31,395	23,284	.7416
1938	31,418	23,326	.7424
1939	31,903	23,940	.7504
1940	32,786	24,930	.7604
1941	33,850	25,915	.7656
1942	33,221	25,647	.7720
1943	32,156	24,956	.7761
1944	31,794	24,820	.7807
1945	32,642	25,383	.7776
1946	38,579	30,139	.7812
1947	45,453	35,701	.7854
1948	52,404	41,461	.7912
1949	58,477	46,456	.7944
1950	68,033	54,882	.8067
1951	76,755	62,506	.8144
1952	84,840	69,561	.8199

Column	Source
1	Sum of column 1, Table L-1, and column 1, Table L-2.
2	Sum of column 2, Table L-1, and column 2, Table L-2.

TABLE L-4  
 Nonfarm Residential Mortgage Debt on One- to Four-Family Homes  
 and on Multi-family Dwellings, 1925-1952  
 (millions of dollars)

	<i>1- to 4- Family (1)</i>	<i>Multi- family (2)</i>		<i>1- to 4- Family (1)</i>	<i>Multi- family (2)</i>
1925	12,984	4,247	1940	17,346	6,464
1926	14,809	5,147	1941	18,358	6,517
1927	16,433	6,058	1942	18,226	6,441
1928	17,904	7,054	1943	17,835	6,221
1929	18,912	8,089	1944	17,947	6,053
1930	18,891	8,758	1945	18,543	6,100
1931	18,104	8,569	1946	23,059	6,400
1932	16,655	8,263	1947	28,161	6,900
1933	15,352	7,731	1948	33,261	7,600
1934	15,630	7,181	1949	37,496	8,400
1935	15,437	6,774	1950	45,072	9,290
1936	15,385	6,530	1951	51,872	10,154
1937	15,518	6,406	1952 <sup>p</sup>	58,155	10,966
1938	15,765	6,281			
1939	16,337	6,403			

<sup>p</sup> Preliminary.

Column

Source

- 1 The series is taken from *Estimated Home Mortgage Debt and Financing Activity*, Federal Home Loan Bank Board, 1952.
- 2 1925-1928: From Raymond W. Goldsmith, *A Study of Saving in the United States*, Princeton University Press, 1955, Vol. I, Table R-34. Goldsmith estimated the values for these years by extrapolation of the 1929 ratio of multi-family mortgage debt to total nonfarm residential mortgage debt. The extrapolation was guided by the share of multi-family construction in total new residential construction for these years.  
 1929-1943: From *Survey of Current Business*, Dept. of Commerce, September 1946, p. 17. These data are based on an older estimate of debt on one- to four-family houses.  
 1944-1949: From Goldsmith, *op. cit.*, Vol. I, Table R-35. These are rough estimates based on construction expenditures for multi-family dwellings.  
 1950-1952: Estimates were obtained by extrapolating the 1949 estimate by the percentage increase from 1949 to 1952 in the Commerce series of mortgages on multi-family and commercial real estate (see *Survey of Current Business*, September 1953, p. 18).

TABLE L-5  
Share of Total Nonfarm Mortgage Debt, Total Nonfarm Residential Mortgage Debt,  
and Total Nonfarm Nonresidential Mortgage Debt  
in Net Private Long-Term Debt,  
Various Years, 1900-1952  
(dollars in billions)

	Net Private Long-Term Debt (1)	Total Mortgage Debt (2)	Total Residential Debt (3)	Nonresidential Debt (4)	Share of Total Mortgage Debt (5)	Share of Total Residential Debt (6)	Share of Total Debt (7)
1900	\$ 18.0	\$ 4.7	\$ 2.9	\$ 1.8	26.1%	16.1%	10.0%
1916	43.3	9.6	6.4	3.2	22.1	14.8	7.4
1925	70.7	24.7	17.2	7.5	34.9	24.3	10.6
1929	88.1	36.9	27.0	9.9	41.9	30.6	11.2
1934	77.7	29.5	22.8	6.7	38.0	29.3	8.6
1939	76.0	28.9	22.7	6.2	38.0	29.9	8.2
1950	125.6	66.7	54.4	12.3	53.1	43.3	9.8
1952	151.8	83.7	69.1	14.6	55.1	45.5	9.6

Column

Source

Column

Source

1 1900: From Simon Kuznets, "Factors in the Demand for Capital Funds," mimeographed, National Bureau of Economic Research, Work Memorandum 43, 1952.  
1916-1952: From *Survey of Current Business*, Dept. of Commerce, September 1953, p. 14. These data represent the sum of net corporate long-term debt and

farm and nonfarm mortgage debt.

2 From Table L-1, column 1.

3 From Table L-1, column 2.

4 Column 2 minus column 3.

5-7 Ratios of columns 2, 3, and 4, respectively, to column 1.

TABLE L-6  
 Ratio of Nonfarm Residential Mortgage Debt to  
 Nonfarm Residential Wealth, 1890-1952  
 (current dollars in millions)

<i>End of Year</i>	<i>Debt (current dollars) (1)</i>	<i>Wealth (current dollars) (2)</i>	<i>Ratio of Debt to Wealth (3)</i>
1890 <sup>a</sup>	\$ 2,292	\$ 14,973	15.3%
1896	2,711	18,103	15.0
1897	2,746	18,387	14.9
1898	2,783	19,703	14.1
1899	2,835	21,607	13.1
1900	2,917	22,936	12.7
1901	3,011	23,116	13.0
1902	3,102	24,256	12.8
1903	3,194	25,494	12.5
1904	3,341	25,739	13.0
1905	3,520	28,118	12.5
1906	3,676	31,971	11.5
1907	3,795	34,255	11.1
1908	3,948	33,977	11.6
1909	4,168	36,369	11.5
1910	4,466	38,397	11.6
1911	4,690	38,417	12.2
1912	4,933	40,063	12.3
1913	5,389	39,401	13.7
1914	5,800	40,251	14.4
1915	6,104	41,986	14.5
1916	6,495	45,527	14.3
1917	7,210	52,987	13.6
1918	7,555	61,972	12.2
1919	7,998	72,163	11.1
1920	9,354	92,155	10.2
1921	10,273	74,791	13.7
1922	11,441	71,329	16.0
1923	13,446	83,501	16.1
1924	15,514	86,633	17.9
1925	18,393	90,802	20.3
1926	21,500	95,999	22.4
1927	24,358	98,639	24.7
1928	27,238	102,438	26.6
1929	29,440	108,429	27.2
1930	30,176	105,430	28.6
1931	29,273	96,761	30.3
1932	27,438	80,537	34.1
1933	25,464	79,100	32.2
1934	24,811	84,669	29.3

(continued on next page)

TABLE L-6 (continued)  
*(current dollars in millions)*

<i>End of Year</i>	<i>Debt (current dollars) (1)</i>	<i>Wealth (current dollars) (2)</i>	<i>Ratio of Debt to Wealth (3)</i>
1935	\$23,891	\$ 81,314	29.4%
1936	23,435	84,770	27.6
1937	23,284	94,297	24.7
1938	23,326	96,831	24.1
1939	23,940	99,264	24.1
1940	24,930	104,102	23.9
1941	25,915	113,548	22.8
1942	25,647	118,922	21.6
1943	24,956	122,450	20.4
1944	24,820	130,960	19.0
1945	25,838	137,348	18.8
1946	30,139	153,140	19.7
1947	35,701	188,396	18.9
1948	41,461	214,358	19.3
1949	46,456	212,430	21.9
1950	54,882	233,623	23.5
1951	62,506	257,833	24.2
1952	69,561	270,918	25.7

<sup>a</sup> June 1.

Column	Source
1	Table L-3.
2	Table D-1.