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# PERSPECTIVE ON BANK CAPITAL ADEQUACY: A TIME SERIES ANALYSIS

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## Abstract

The first part of this paper provides a historical perspective on bank risks. Five-year moving average measures of total risk, market risk, and nonmarket risk are computed for an index of New York banks from 1929-1976 and for an index of outside New York banks from 1950-1976. We use a carefully constructed series of bank balance sheet data to compute correlations among various components of New York banks' portfolios and observe trends over time. The time series relationship between book values and market values is investigated, and classical measures of capital adequacy are calculated using surrogates for market values rather than book values. Finally, data are presented on the movement of interest rates and the term structure over time. Serial correlations and cross correlations are computed.

The second part of the paper uses the technique proposed in Sharpe ("Bank Capital Adequacy, Deposit Insurance and Security Values," June 1978) to gain information about capital adequacy. He has shown that for a bank with deposit liabilities that do not extend beyond the review period a "value preserving spread" in asset risk is likely to increase the value of capital. Moreover, the less adequate the capital, the larger this effect should be. We outline the method used to develop an econometric model to test for this effect. The model is then applied to time series data from 1938 to 1975.

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## SECTION A-1

## Historical Perspective on Bank Risks

In an effort to provide some historical perspective, we have computed five year moving average measures of total risk, market risk and non-market risk for a group of New York Banks from 1929-1976 and for a group of Outside New York Banks from 1950-1976.

The analysis uses Standard and Poor's[1] indices of (1) New York City Bank Stocks, (2) Outside New York City Bank Stocks, and (3) Standard and Poor's composite Index. Each index is computed monthly, using a weighted average of market prices on the last Wednesday of the month, with prices weighted by the number of shares outstanding. The changes in the stocks utilized in the indices are handled by adjusting a "divisor" to keep the series comparable.

The banks used in the New York City Bank Index and the Outside New York City Bank Index are shown in Table A-1.1. Standard and Poor's composite was composed of 500 stocks in 1976, consisting of 83 industrial groups totaling 425 companies, 15 railroad companies, and 4 utility groups totaling 60 companies. Monthly data were used for the following periods:

Standard and Poor's Composite Index    January, 1929 - December, 1976

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[1]The analysis was repeated using Moody's indices. The results were virtually identical. The Moody's series used were (1) New York Bank Stocks, (2) Outside New York Bank Stocks and (3) Moody's Industrial Stock Index. The latter index utilizes 125 stocks. The correlations between the relative change in the Moody's Index used and the relative change in the appropriate Standard and Poor's Index were:

| Year | | Correlation |
|---|---|---|
| 2/29-3/75 | Standard and Poor's Composite -- Moody's Industrial | .910 |
| 2/29-3/75 | Standard and Poor's New York City Banks -- Moody's New York City Banks | .923 |
| 2/57-3/75 | Standard and Poor's Outside New York City Banks -- Moody's Outside New York City Banks | .918 |

| | |
|---|---|
| Standard and Poor's New York City Bank Index | January, 1929 - December, 1976 |
| Standard and Poor's Outside New York City Bank Index | January, 1950 - December, 1976 |

The relative changes (monthly) in the indices were computed. The standard deviations of the relative changes of the indices were calculated for the five year moving average periods. Table A-1.2 shows the standard deviations of the relative changes in Standard and Poor's composite Index, which measure the riskiness of the market. These data are graphed in Figure A-1.1. For all Tables and Charts in this Section, the year indicated refers to the year at the beginning of the period. For example, "1930" refers to a period utilizing data from month-end December, 1929 through month-end December, 1934. Exceptions are made for the first period in each series. For the New York City Banks, "1929" utilizes data from month-end January, 1929 to month-end January, 1934. For the index of banks Outside New York, the "1950" period utilizes data from month-end January, 1950 through month-end January, 1955. Table A-1.3 shows the standard deviations of the relative change in Standard and Poor's New York City Bank Stock Index which measure the total risk of the index. This is graphed in Figure A-1.2. Table A-1.6 shows the standard deviations of the relative changes in the Outside New York City Stock Index. These data are graphed in Figure A-1.5.

Five year moving average regressions of the form

$$\begin{matrix}\text{Relative charge} \\ \text{of Bank Index}\end{matrix} = \alpha + \beta \cdot \begin{matrix}\text{Relative charge} \\ \text{of Market Index}\end{matrix} + \tilde{\varepsilon}$$

were run for both bank indices. The "Beta" coefficient of this regression is the sensitivity of changes in the bank index to changes in the market. Betas for the New York Banks are graphed in Figure A-1.3 and printed in Table A-1.4. Betas for the Outside New York Banks are graphed in Figure

A-1.7 and printed in Table A-1.8. With one exception in each, the $\alpha$ coefficient of the regressions were insignificantly different from zero at the 5% significance level for the New York City Banks and the Outside New York City Banks. The market risk of the bank stocks can be computed by multiplying Beta times the standard deviation of the industrial index. These values are listed in Table A-1.5 and graphed in Figure A-1.4 for the New York City Bank stocks, and listed in Table A-1.9 and graphed in Figure A-1.8 for the Outside New York City Bank stocks. The standard errors of the regressions measure the non-market risk of the corresponding portfolios of bank stocks. These values are printed in Table A-1.6 and graphed in Figure A-1.5 for the New York City Bank stocks, and printed in Table A-1.10 and graphed in Figure A-1.9 for the Outside New York City Bank Stocks.

TABLE A-1.1

NEW YORK CITY BANK STOCKS

*Bank of New York
   Bank of New York & Fifth Ave. Bank (Jan. 1918)

*Bankers Trust New York Corp. (formerly BT New York; Bankers Trust Co.) (4-13-55)
   Bankers Trust Co., (Jan. 1918 to 4-8-55)
   Public National Bank & Trust Co. (Jan. 1918 to 4-6-55)

*Charter New York Corp. (Jan. 1918)
   Formerly Irving Trust

*Chase Manhattan Corp. (4-13-55)
   Bank of the Manhattan Co. (Jan. 1918 to 4-6-55)
   Chase National Bank (Jan. 1918 to 4-6-55)

*Chemical N.Y. Corp. (formerly Chemical Bank N.Y. Trust) (10-15-54)
   Chemical Bank & Trust (Jan. 1918 to 10-8-54)
   Corn Exchange Bank & Trust (Jan. 1918 to 10-8-54)
   New York Trust Co. (Jan. 1918 to 9-23-59)

*Citicorp (formerly First National City Bank) (4-6-55)
   First National Bank (Jan. 1918 to 3-30-55)
   National City Bank (Jan. 1918 to 3-30-55)

*Manufacturers Hanover (9-13-61)
   Manufacturers Trust Co. (Jan. 1918 to 9-6-61)
   Chatham-Phenix Bank & Trust Co. (Jan. 1918 to 2-10-32) Hanover Bank (Jan. 1918)
   Hanover National Bank (Jan. 1918 to 9-6-61)

*Morgan (J.P.) & Co. (Formerly Morgan Guaranty Co.) (5-13-59) Guaranty Trust Co. (Jan. 1918 to 1-18-59)
   National Bank of Commerce (Jan. 1918)

*United States Trust Co. (2-10-32) Title Guarantee & Trust Co. (Jan. 1918 to 1-9-35)

Brooklyn Trust Co. (4-17-30 to 10-11-50)

Commercial National Bank & Trust Co. (4-22-31 to 5-24-51)

Continental Bank & Trust Co. (2-10-32 to 1-19-49)

Empire Trust Co. (Jan. 1918 to 12-14-66)

*currently in index

TABLE A-1.1
(continued)

BANKS OUTSIDE NEW YORK CITY

*Bankamerica Corp., formerly Bank of America N.T.S.A (Jan. 1941)

*Clev Trust Corp. (formerly Cleveland Trust) (Jan. 1941)

*Continental Illinois Corp. (formerly Conill Corp.; (Continental Illinois Bank of Chicago) (Jan. 1941)

*Crocker National, formerly Crocker Citizens (1-11-67)

*First Chicago Corp., formerly First National Bank of Chicago (Jan. 1941)

*First National Bank of Boston (11-21-56)

*First Pennsylvania Corp., formerly First Pennsylvania Bank & Trust Co. (11-21-56)

*First Union Inc. (8-6-69)

*Mercantile Bancorporation (formerly Mercantile Trust of St. Louis) (9-5-51)

*National City Corp. (formerly National City Bank of Cleveland) (Jan. 1941)

*National Detroit Corp. (formerly National Bank of Detroit) (Jan. 1941)

*Philadelphia National Corp. (formerly PNB Corp; Philadelphia National Bank) (9-18-57)

*Pittsburgh National Bank (9-30-59)

*Republic of Texas (formerly Republic National Bank of Dallas) (11-21-56)

*Security Pacific Corp. (formerly Security Pacific National Bank; Sec. 1st N.B.L.A.) (7-26-50)

*Wells Fargo (5-12-65)

Central National Bank of Cleveland (1-41 to 9-11-57)

First Bank St. Corp. of Minneapolis (11-21-56 to 9-11-57)

First National Bank of Dallas (11-21-59 to 1-4-67)

First National Bank of St. Louis (7-26-50 to 8-6-69)

National Shawmut Bank of Boston (11-21-56 to 5-12-65)

Peoples 1st of Pittsburgh (8-46 to 9-23-59)

*currently in index

TABLE A-1.2

Standard Deviations of the Relative Change in the Standard and Poor's Composite Index ($\sigma_{mkt}$)

| | | | | |
|---|---|---|---|---|
| 1929 | 0.126949 | 0.12297 | 0.119409 | 0.104953 |
| 1933 | 0.079945 | 0.076691 | 0.07627 | 0.080254 |
| 1937 | 0.079019 | 0.073111 | 0.053574 | 0.046264 |
| 1941 | 0.037656 | 0.040917 | 0.038556 | 0.041931 |
| 1945 | 0.043551 | 0.043099 | 0.037061 | 0.037396 |
| 1949 | 0.031503 | 0.031799 | 0.032655 | 0.035847 |
| 1953 | 0.037467 | 0.037446 | 0.036102 | 0.035744 |
| 1957 | 0.032823 | 0.041095 | 0.040341 | 0.039234 |
| 1961 | 0.036304 | 0.037961 | 0.027253 | 0.029116 |
| 1965 | 0.033164 | 0.040291 | 0.043162 | 0.041907 |
| 1969 | 0.04356 | 0.048165 | 0.047515 | 0.045118 |

TABLE A-1.3

Standard Deviations of the Relative Change in the Standard and Poor's New York City Bank Stock Index

| | | | | |
|---|---|---|---|---|
| 1929 | 0.149409 | 0.139767 | 0.137547 | 0.1227 |
| 1933 | 0.1022 | 0.093427 | 0.08245 | 0.078953 |
| 1937 | 0.076159 | 0.066337 | 0.056795 | 0.050273 |
| 1941 | 0.041857 | 0.039314 | 0.033808 | 0.032234 |
| 1945 | 0.032458 | 0.029991 | 0.028428 | 0.027671 |
| 1949 | 0.028297 | 0.027492 | 0.026578 | 0.026291 |
| 1953 | 0.028779 | 0.026138 | 0.030036 | 0.03196 |
| 1957 | 0.034279 | 0.045813 | 0.046384 | 0.044353 |
| 1961 | 0.045335 | 0.052842 | 0.043744 | 0.048453 |
| 1965 | 0.054561 | 0.064002 | 0.059337 | 0.060664 |
| 1969 | 0.062364 | 0.066573 | 0.069119 | 0.069993 |

TABLE A-1.4

Betas: New York City Bank Index

| | | | | |
|---|---|---|---|---|
| 1929 | 0.99001 | 0.983065 | 0.963336 | 0.917244 |
| 1933 | 0.867722 | 0.925353 | 0.831894 | 0.819737 |
| 1937 | 0.84122 | 0.799176 | 0.906875 | 0.922637 |
| 1941 | 0.855863 | 0.647389 | 0.576275 | 0.507946 |
| 1945 | 0.509153 | 0.443518 | 0.45479 | 0.416964 |
| 1949 | 0.41996 | 0.351704 | 0.347735 | 0.337187 |
| 1953 | 0.349268 | 0.321428 | 0.38989 | 0.427788 |
| 1957 | 0.545864 | 0.822922 | 0.849733 | 0.842982 |
| 1961 | 0.9494 | 0.969082 | 0.847381 | 0.736384 |
| 1965 | 0.91505 | 1.05957 | 0.88384 | 0.864151 |
| 1969 | 0.982016 | 0.937748 | 0.929155 | 1.03347 |

TABLE A-1.5

Market Risk -- Beta Times $\sigma_{mkt}$
New York City Banks

| | | | | |
|---|---|---|---|---|
| 1929 | 0.125681 | 0.120887 | 0.115031 | 0.096267 |
| 1933 | 0.06937 | 0.070966 | 0.063448 | 0.065788 |
| 1937 | 0.066472 | 0.058428 | 0.048585 | 0.042685 |
| 1941 | 0.032228 | 0.026489 | 0.022219 | 0.021298 |
| 1945 | 0.022174 | 0.019115 | 0.016855 | 0.015593 |
| 1949 | 0.01323 | 0.011184 | 0.011355 | 0.012087 |
| 1953 | 0.013086 | 0.012036 | 0.014076 | 0.015291 |
| 1957 | 0.017917 | 0.033818 | 0.034279 | 0.033074 |
| 1961 | 0.034467 | 0.036787 | 0.023094 | 0.02144 |
| 1965 | 0.030347 | 0.042691 | 0.038148 | 0.036214 |
| 1969 | 0.042776 | 0.045167 | 0.044149 | 0.046628 |

TABLE A-1.6

Nonmarket Risk -- New York City Banks

| | | | | |
|---|---|---|---|---|
| 1929 | 0.0815 | 0.070753 | 0.076059 | 0.076731 |
| 1933 | 0.075695 | 0.061286 | 0.053105 | 0.044027 |
| 1937 | 0.03749 | 0.031681 | 0.029666 | 0.026785 |
| 1941 | 0.026939 | 0.0293 | 0.0257 | 0.024402 |
| 1945 | 0.023906 | 0.023308 | 0.023089 | 0.023055 |
| 1949 | 0.025228 | 0.02533 | 0.024237 | 0.023548 |
| 1953 | 0.025852 | 0.023401 | 0.026762 | 0.028306 |
| 1957 | 0.029475 | 0.031172 | 0.031516 | 0.029805 |
| 1961 | 0.029701 | 0.03826 | 0.03747 | 0.043825 |
| 1965 | 0.045733 | 0.048094 | 0.04584 | 0.049086 |
| 1969 | 0.045771 | 0.049326 | 0.053638 | 0.052648 |

TABLE A-1.7

Standard Deviations of the Relative Change in the
Standard and Poor's Outside New York City Bank Index

| | | | | |
|---|---|---|---|---|
| 1950 | 0.026905 | 0.02505 | 0.025039 | 0.027602 |
| 1954 | 0.026383 | 0.02624 | 0.026705 | 0.029529 |
| 1958 | 0.042885 | 0.043078 | 0.043671 | 0.044001 |
| 1962 | 0.047743 | 0.035599 | 0.03993 | 0.044383 |
| 1966 | 0.055152 | 0.051963 | 0.053239 | 0.054525 |
| 1970 | 0.065497 | 0.068062 | 0.071373 | |

TABLE A-1.8

Betas: Outside New York City Bank Index

| | | | | |
|---|---|---|---|---|
| 1950 | 0.43958 | 0.355626 | 0.334057 | 0.387521 |
| 1954 | 0.403904 | 0.414535 | 0.463301 | 0.564074 |
| 1958 | 0.833966 | 0.861074 | 0.901198 | 0.994668 |
| 1962 | 0.994952 | 0.79014 | 0.635794 | 0.775397 |
| 1966 | 0.996455 | 0.893475 | 0.898861 | 1.00143 |
| 1970 | 1.06396 | 1.06767 | 1.17904 | |

TABLE A-1.9

Market Risk -- Beta Times $\sigma_{mkt}$
Outside New York City Banks

| | | | | |
|---|---|---|---|---|
| 1950 | 0.013976 | 0.011613 | 0.011975 | 0.014519 |
| 1954 | 0.015125 | 0.014965 | 0.01656 | 0.018514 |
| 1958 | 0.034272 | 0.034737 | 0.035358 | 0.036111 |
| 1962 | 0.037769 | 0.021534 | 0.018512 | 0.025715 |
| 1966 | 0.040148 | 0.038564 | 0.037668 | 0.043622 |
| 1970 | 0.051246 | 0.050731 | 0.053196 | |

TABLE A-1.10

Nonmarket Risk -- Outside New York City Banks

| | | | | |
|---|---|---|---|---|
| 1950 | 0.0232 | 0.022386 | 0.022178 | 0.023676 |
| 1954 | 0.021803 | 0.021739 | 0.02113 | 0.023201 |
| 1958 | 0.026 | 0.025695 | 0.025852 | 0.025356 |
| 1962 | 0.029456 | 0.028591 | 0.035683 | 0.036485 |
| 1966 | 0.038139 | 0.035127 | 0.037946 | 0.032993 |
| 1970 | 0.041139 | 0.045764 | 0.047993 | |

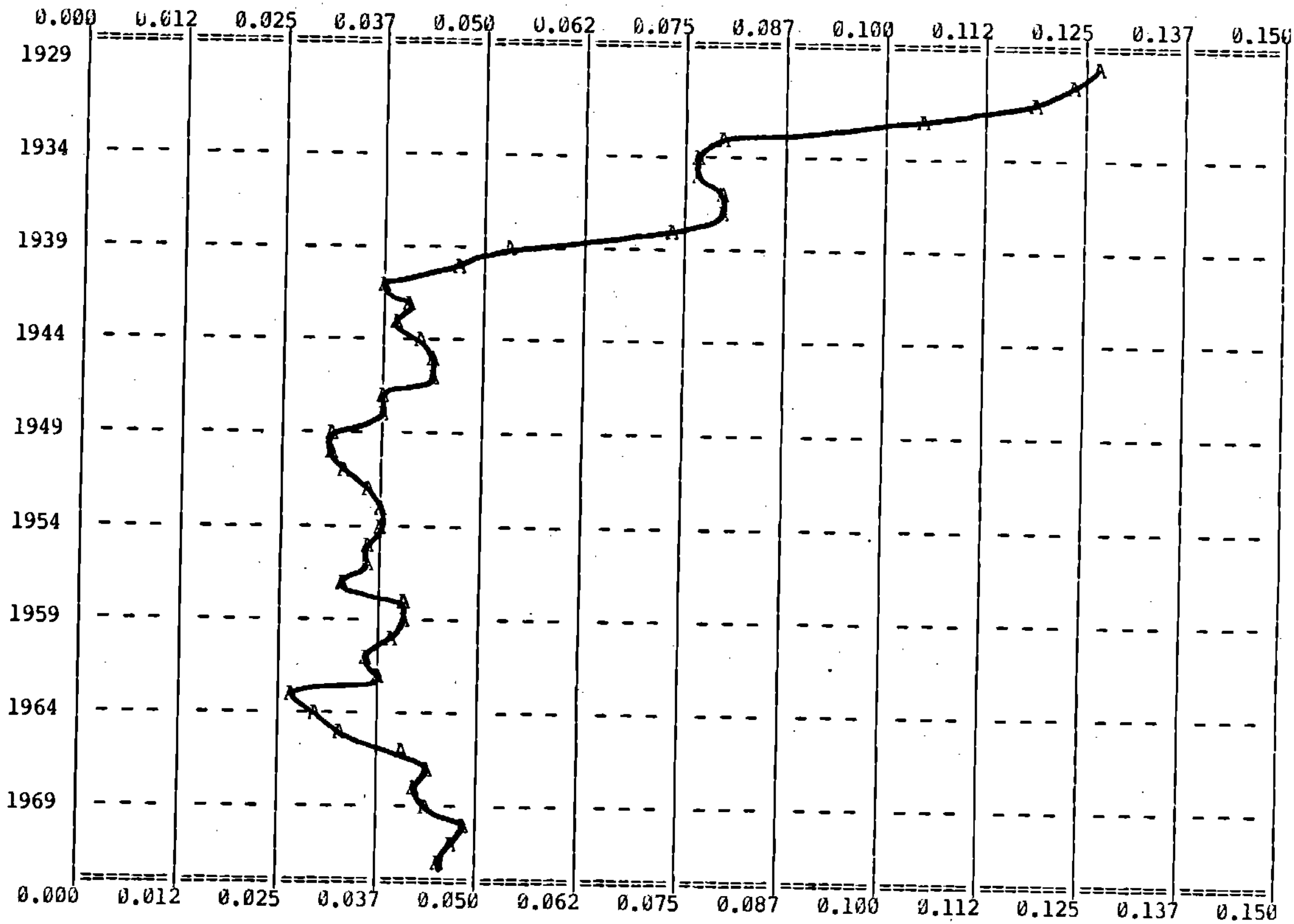


FIGURE A-1.1

Standard Deviation of the Relative Change in the Standard and Poor's Composite Index

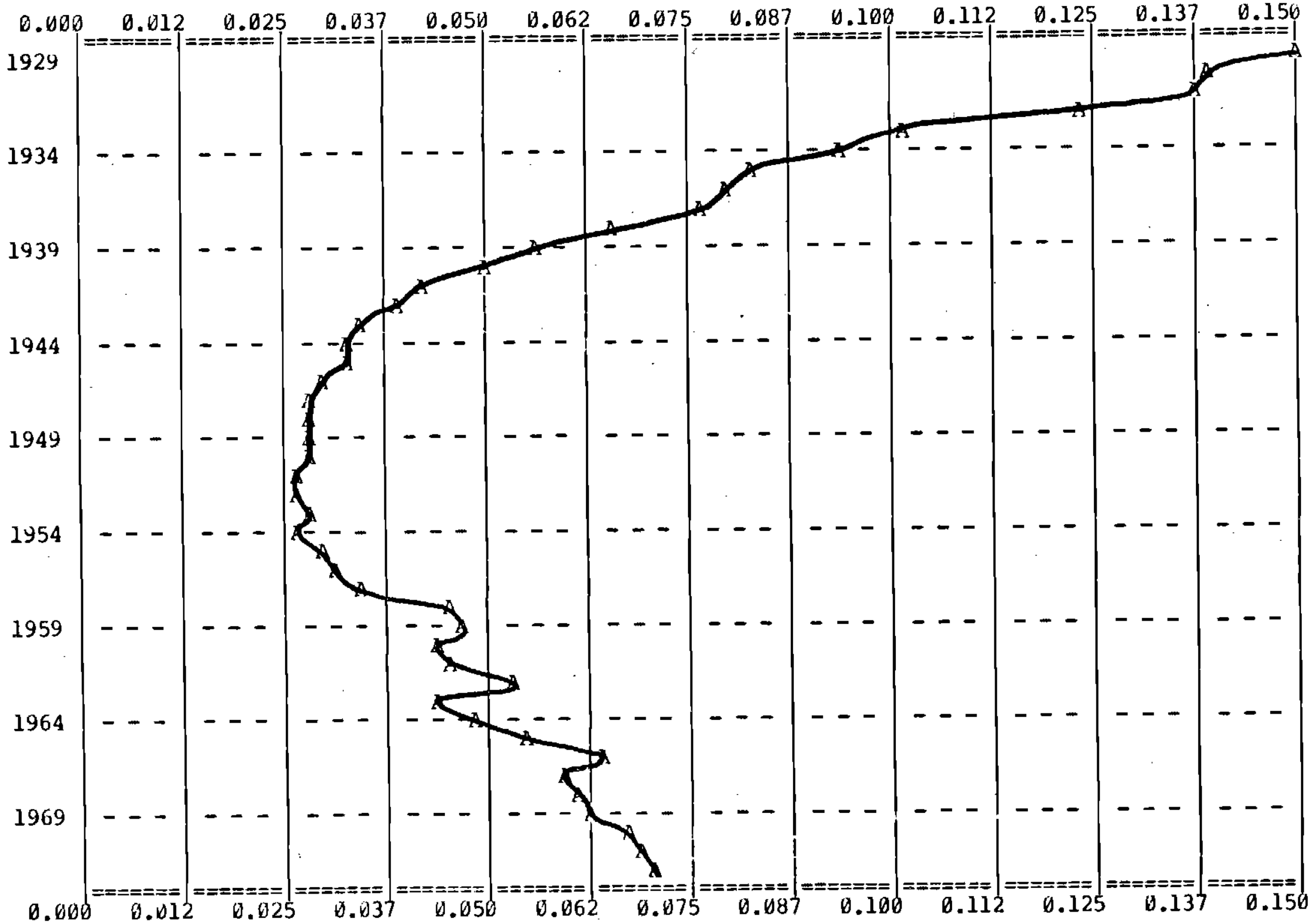


FIGURE A-1.2

Standard Deviation of the Relative Change in the Standard and Poor's New York City Bank Index

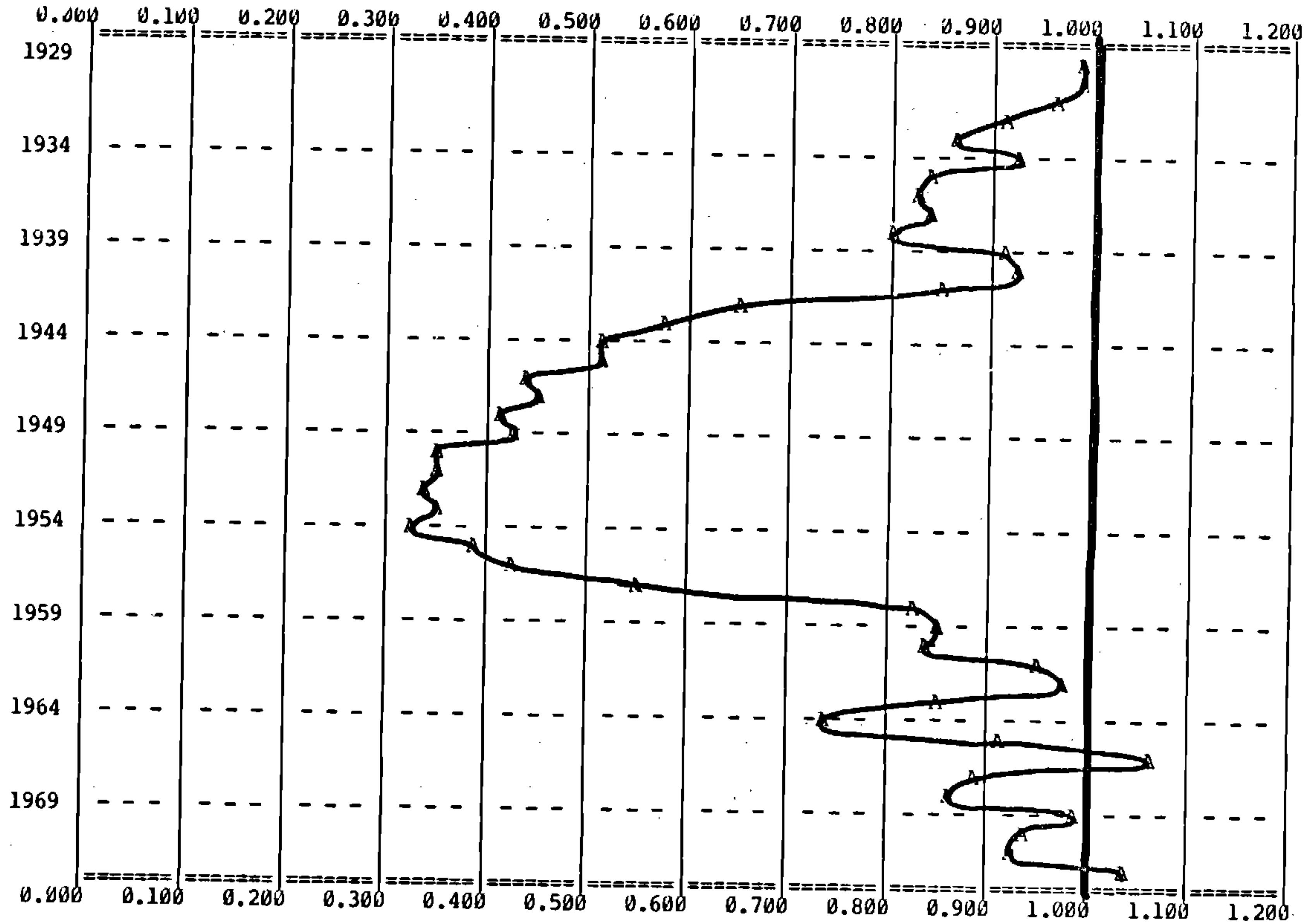


FIGURE A-1.3

Beta: Standard and Poor's New York City Banks

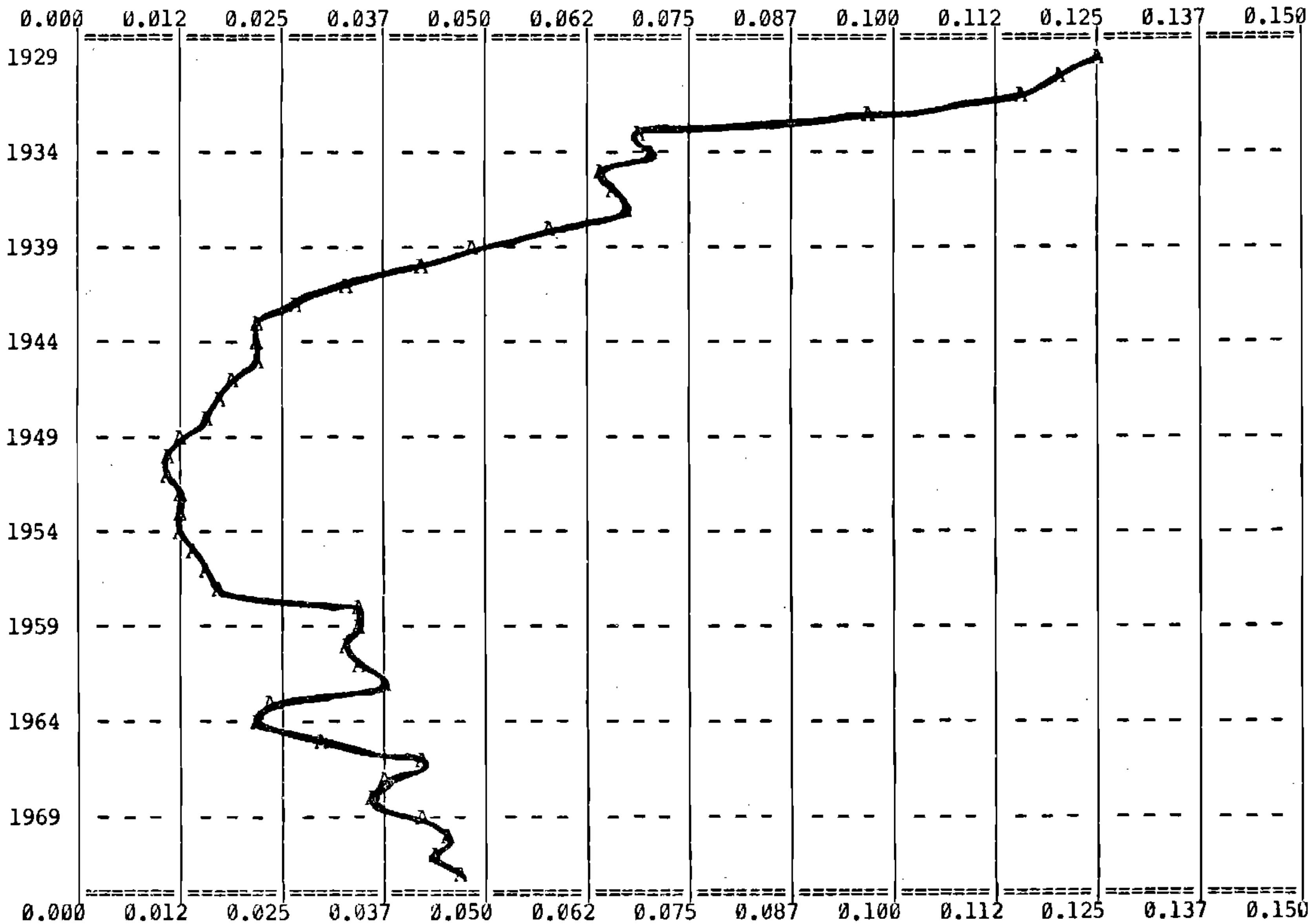


FIGURE A-1.4

Total Market Risk -- Standard and Poor's New York City Banks $(B \cdot \sigma_{mkt})$

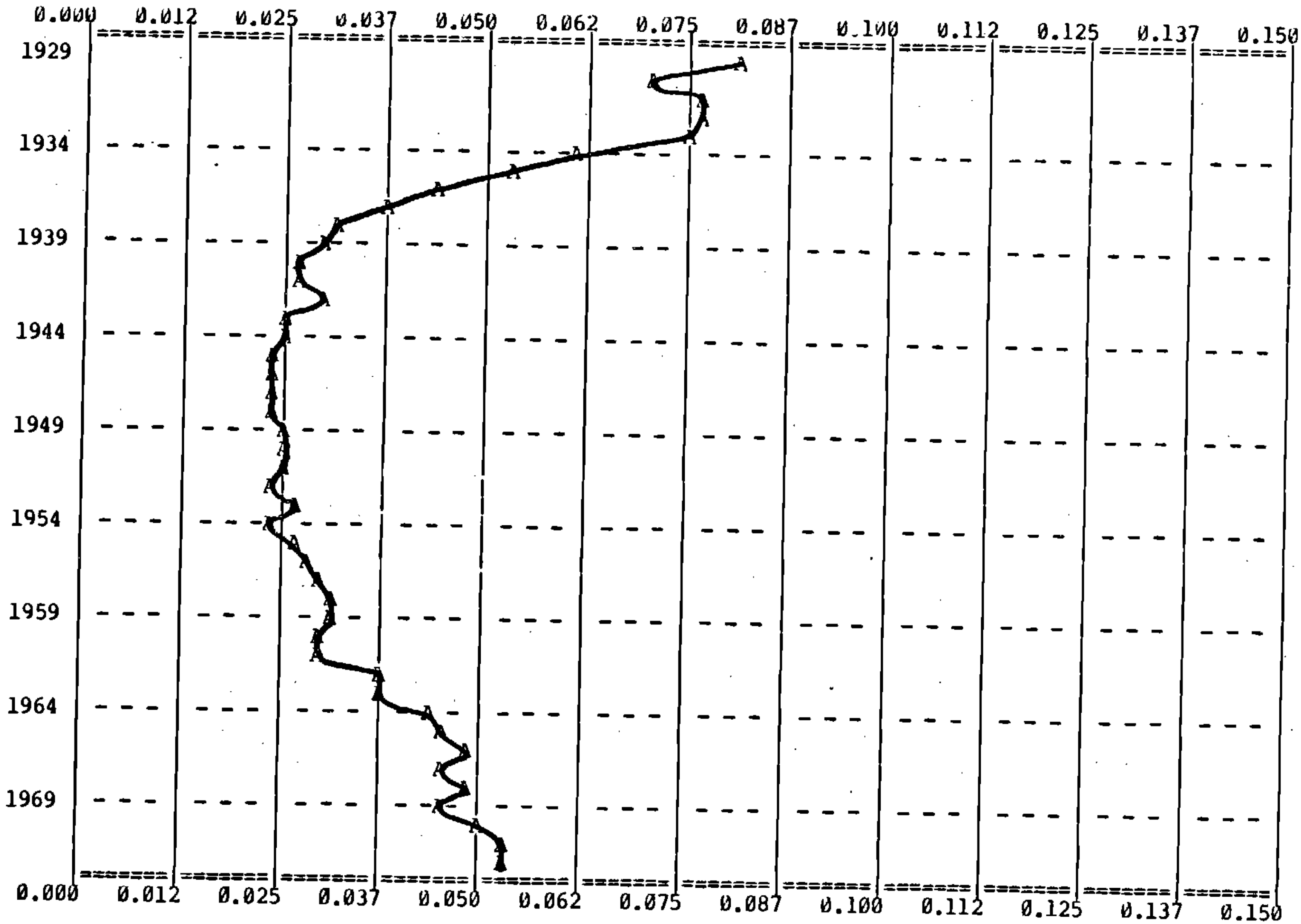


FIGURE A-1.5

Standard Error -- Standard and Poor's New York City Banks Regressions

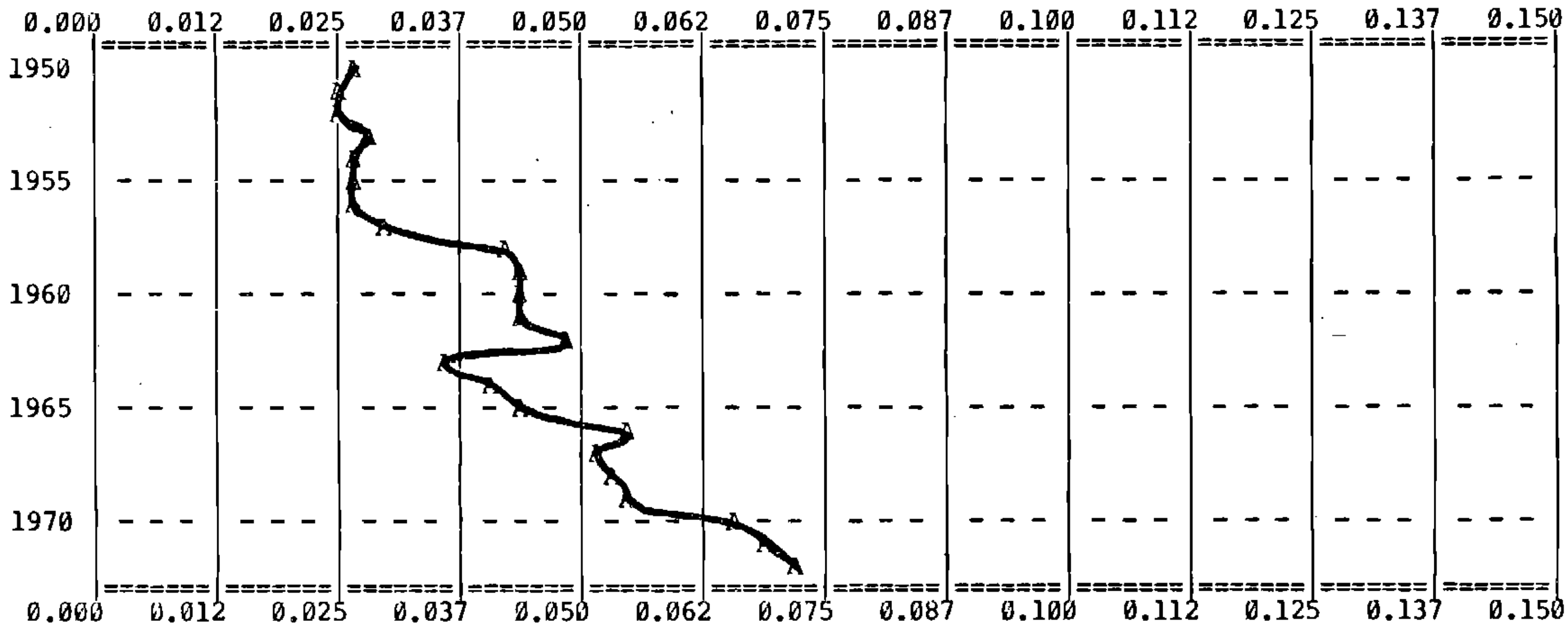


FIGURE A-1.6

Standard Deviation of the Relative Change in the Standard and Poor's Outside New York City Bank Index

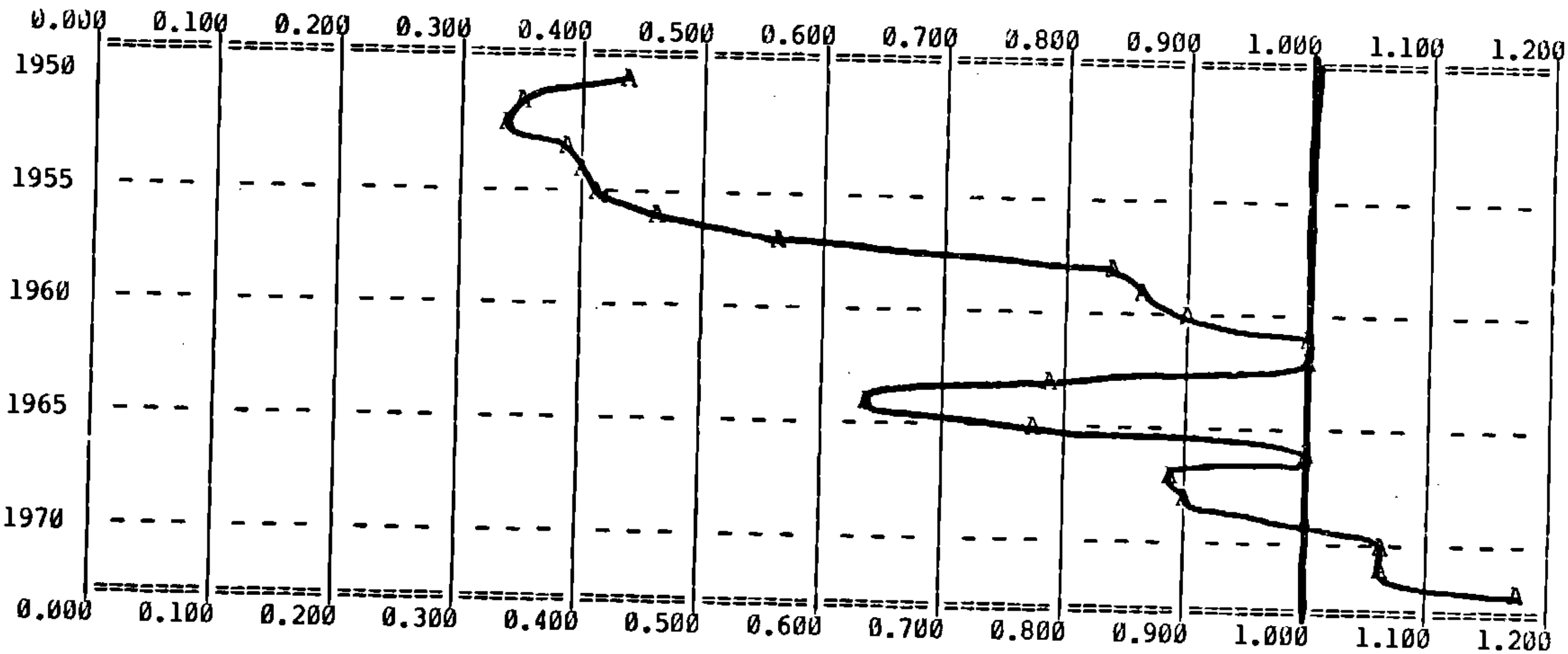


FIGURE A-1.7

Beta: Standard and Poor's Outside New York City Banks

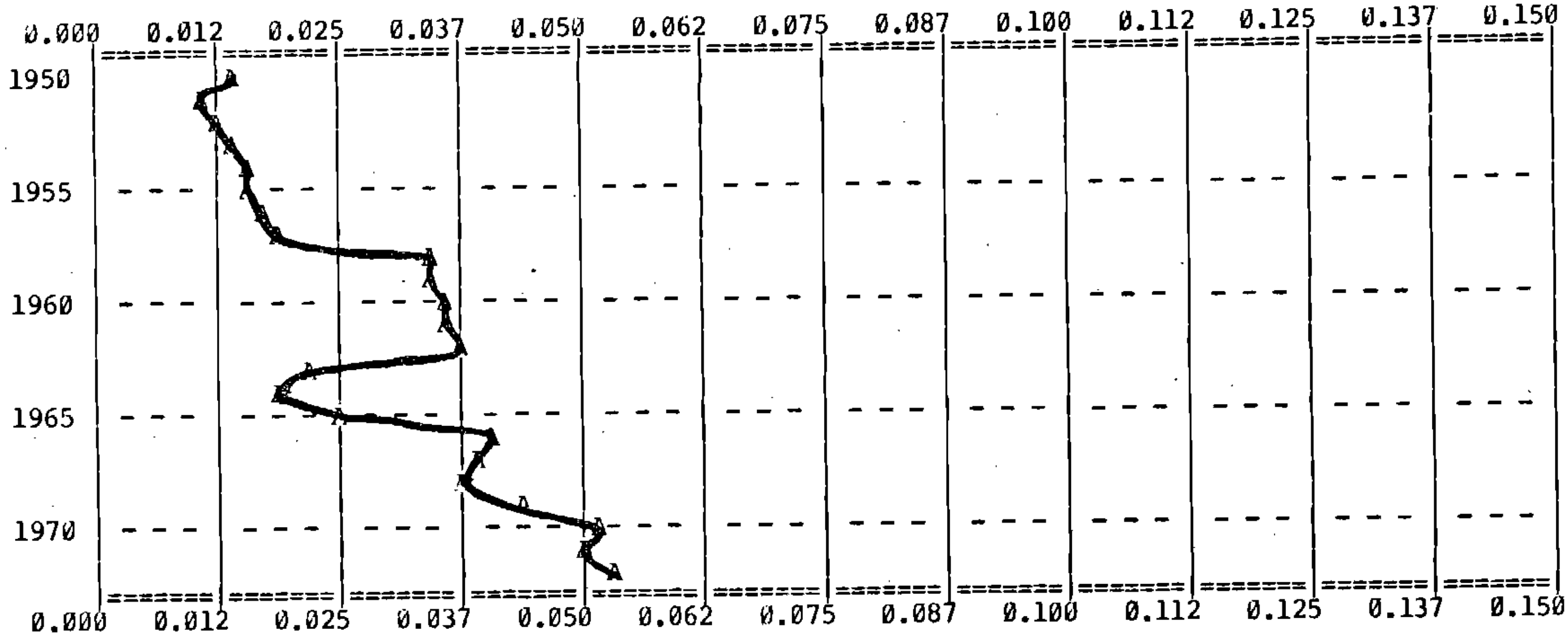


FIGURE A-1.8

Total Market Risk -- Standard and Poor's Outside New York City Banks $(B \cdot \sigma_{mkt})$

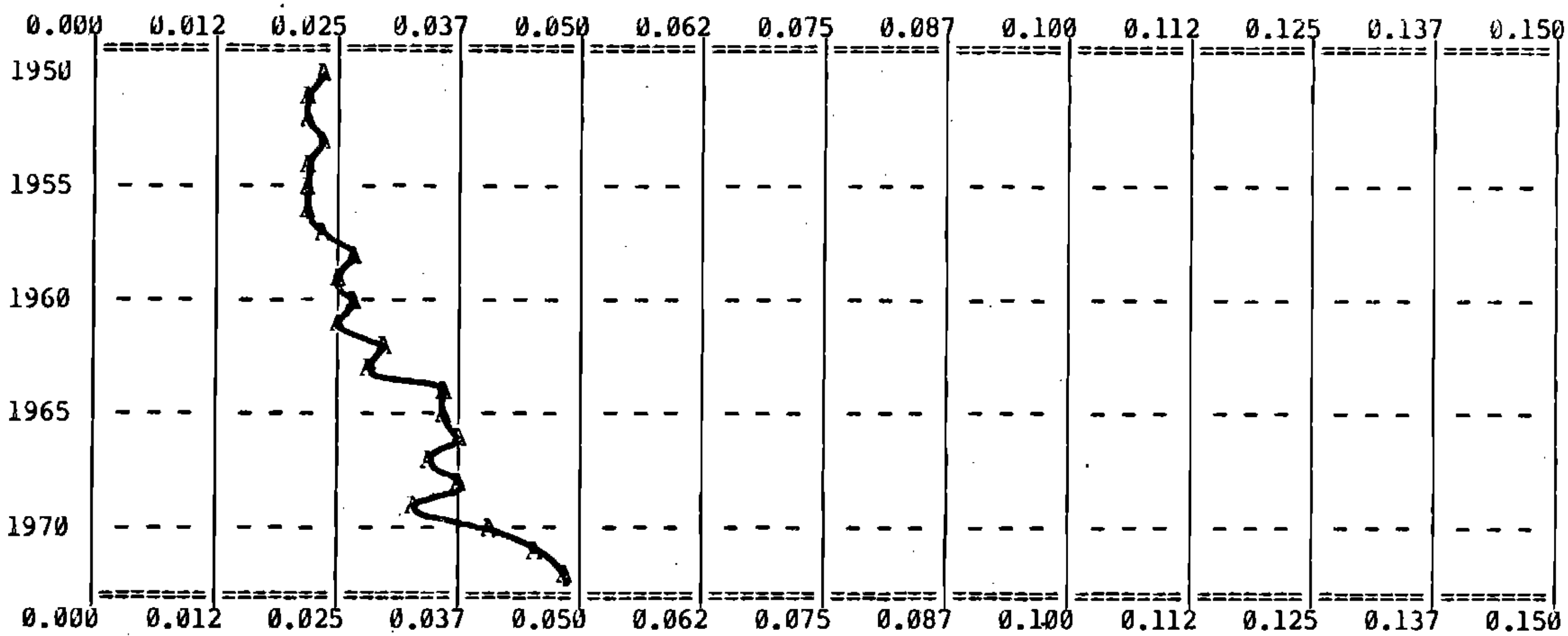


FIGURE A-1.9

Standard Error -- Standard and Poor's Outside New York City Bank Regressions

## SECTION A-2

### Historical Perspective on Balance Sheet Data

In an effort to provide historical perspective on bank balance sheet data, we have computed correlations among various components of New York Banks' portfolios and graphed trends over time. New York banks were chosen because balance sheet data could be matched fairly well with available market-value data.

The analysis uses balance sheet data for Central Reserve City Member Banks of New York City (1928-1941), Reserve City Member Banks of New York City (1942-1970) and Large Member Banks in New York City (1971-1975). This information is available in Banking and Monetary Statistics, a three-volume publication of the Board of Governors of the Federal Reserve System. The Federal Reserve calculates the data by aggregating call report data on each central reserve city, reserve city, or large member bank in New York City. The call report data are gathered from two to four times a year. In an effort to make the balance sheet data comparable with market index data, all call reports filed during the first 15 days of the month were attributed to the previous month. Thus, September, 1970 can refer to call report data from September 16 - October 15, 1970. Linear interpolation between call reports was used to produce monthly data. The data used in our work covered the period from December, 1928 to December, 1975. The design of the call report has changed throughout the period, hence it was necessary to aggregate categories substantially to obtain consistent series across the whole period. The series are described in Table A-2.1.

Variables of particular interest are (1) the amounts of specific categories of assets or liabilities relative to the amount of capital, and

(2) the amounts of such categories of assets or liabilities relative to total assets. The statistics associated with these series are shown in Tables A-2.2 and A-2.3.[2] A prefix of "p" before a series name denotes $\frac{\text{asset}}{\text{capital}}$ or $\frac{\text{liability}}{\text{capital}}$. For example, the series pas2 refers to $\frac{\text{as2}}{\text{capital}}$. A prefix of "q" before a series name denotes $\frac{\text{asset}}{\text{total assets}}$ or $\frac{\text{liability}}{\text{total assets}}$. The series "qeq" refers to $\frac{\text{capital}}{\text{total assets}}$. The correlations among the ratios of the series to capital are shown in Table A-2.4. The correlations among the ratios of the series to total assets are shown in Table A-2.5.

The figures show changes in the book values of various assets and liabilities relative to capital and total assets. Only values on the last month of each quarter are shown. For example, 1928 4th refers to December, 1928.

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[2] The statistics provided are: NOB = number of observations
mean
min = minimum
max = maximum
std. deviation = standard deviation

TABLE A-2.1

Balance Sheet Data Series

AS Total Assets

1928-70: Total Assets

1971-75: Total Assets - Reserves for Bad Debts

AS1 Cash, Bank Balances, Items in Process

1928-41: Reserves with Federal Reserve Banks + Cash in Vault + Balances with Domestic Banks + Balances with Foreign Banks + Cash Items in Process of Collection

1942-70: Reserves with Federal Reserve Banks + Currency and Coin + Balances with Domestic Banks + Balances with Foreign Banks + Cash Items

1971-75: Reserves with Federal Reserve Banks + Currency and Coin + Demand Balances with Banks in U.S. + Other Balances with Banks in the U.S. + Balances with Banks in Foreign Countries + Cash Items in Process of Collection

AS2 Loans (Net of Valuation Resources)

1928-70: Total Loans

1971-75: Federal Funds Sold and Securities Purchased Under Agreements to Resell + Other Loans - Reserves for Bank Debts

AS2.1 Loans on Securities (Except to Banks)

1928-Sept. 1938: Loans on Securities, Except to Banks, Total

Dec. 1938-Dec. 1947: Loans for Purchasing or Carrying Securities (1) to Brokers and Dealers, (2) to Others

June 1948-Dec. 1970: Loans for Purchasing or Carrying Securities ((1) to Brokers and Dealers, (2) to Others)·f, where f = $\left(1 - \frac{\text{reserves for bad debts}}{\text{total loans, gross}}\right)$ and total loans, gross = total loans (net) + reserves for bad debts

June 1971-Dec. 1975: (Loans on Securities to Brokers and Dealers + Other Loans for Purchasing and Carrying Securities)·f (as defined above)

TABLE A-2.1
(continued)

AS2.2 Real Estate Loans, Net

1928-47: Real Estate Loans, Total

1948-75: Real Estate Loans, Total·f where $f = \frac{\text{net total loans}}{\text{gross total loans}}$

AS2.3 Loans to Banks

1928-41: Loans to Banks

1942-47: Loans to Financial Institutions/Banks

1948-70: Loans to Financial Institutions/Banks·f where $f = \frac{\text{net total loans}}{\text{gross total loans}}$

1971-75: ([1] Federal funds sold and securities purchased under agreements to resell + [2] loans to domestic and foreign banks)·f where $f = \frac{\text{net total loans}}{\text{gross total loans}}$

AS2.4 Other Loans (Primarily Commercial and Industrial)

1928-75: Net Loans - Loans on Securities, Net - Real Estate Loans, Net - Loans to Banks, Net

AS3 Fixed Assets

1928-70: Bank Premises + Other Real Estate

1971-75: Fixed Assets - Building, Furniture, Real Estate

AS4 Customer's Liability on Acceptances

1928-70: Customer's Liability on Acceptances

1971-75: Customer's Acceptances Outstanding

AS5 Other Assets

1928-75: Other Assets (Note 1940, 1941 data taken from Volume 2 of Banking and Monetary Statistics; the original Data was Revised)

AS6 Total Investments

1928-70: Investments, Total

TABLE A-2.1
(continued)

1971-75: Total Securities held, Book Value + Investment in Subsidiaries not Consolidated

AS6.1 U.S. Treasury Securities

1928-41: U.S. Government Obligations, Direct + U.S. Government Securities, Guaranteed

1942-70: U.S. Government Securities, Direct + U.S. Government Securities, Guaranteed

1971-75: U.S. Treasury

AS6.1.1 Treasury Bills and Certificates

1928-41: U.S. Government Obligations/Direct/Bills

1942-70: U.S. Government Obligations/Direct/Bills + U.S. Government Obligations/Direct/Certificates (except Dec. 1968, Dec. 1969, Dec. 1970 obtained by applying the percent breakdown for weekly reporting New York City Banks to AS6.1. The weekly reporting data is in the Federal Reserve Bulletin).

1971-75: Estimated by applying percent breakdown for weekly reporting New York City Banks to AS6.1.

AS6.1.2 Notes and Bonds (Including Guaranteed U.S. Government Agencies)

1928-41: U.S. Government Obligations/Direct/Notes + U.S. Government Obligations/Direct/Bonds + U.S. Government Obligations/Guaranteed

1942-70: U.S. Government Securities/Notes/Maturing Within One Year + U.S. Government Securities/Notes/Maturing After One Year + U.S. Government Securities/Bonds/Total + U.S. Government Securities/Guaranteed (except Dec. 1968, Dec. 1969, and Dec. 1970 obtained by applying the percent breakdown for weekly reporting New York City Banks to AS6.1)

1971-75: Estimated by obtaining percent breakdown for weekly reporting New York City Banks to AS6.1.

AS6.2 State and Political Subdivision

1928-41: Obligations of States and Political Subdivisions

1942-70: Securities of States, etc.

1971-75: Total Securities Held, Book Value/State and Political subdivisions

TABLE A-2.1
(continued)

AS6.3 Other Securities

1928-41: Other Domestic Securities/Total + Foreign Securities

1942-70: Other Bonds, Notes and Debenture/Federal Agency + Other Bonds, Notes and Debentures, Other + Corporate Stock (including Federal Reserve Bank Stock)

1971-75: Total Securities Held, Book Value/Other U.S. Government Agencies + Total Securities Held, Book Value/All Other Securities + Investments in Subsidiaries Not Consolidated

Total Liabilities = Total Assets

LB1 Demand Deposits

1928-75: Demand Deposits, Total (Adjusted slightly so total liabilities = total assets)

LB2 Time Deposits

1928-75: Time Deposits, Total

LB3 Borrowing

1928-70: Borrowing

1971-75: Federal Funds Purchased and Securities Sold Under Agreements to Repurchase + Other Liabilities for Borrowed Money

LB4 Acceptances Outstanding

1928-70: Acceptances Outstanding

1971-75: Bank Acceptances Outstanding

LB5 Other Liabilities

1928-70: Other Liabilities

1971-75: Other Liabilities + Mortgage Indebtedness

Capital:

LB6 Preferred Stock, Notes and Debentures

1928-70: Preferred Stock

1971-75: Capital Notes and Debentures + Preferred Stock

LB7 Equity

1928-70: Capital Accounts/Total - Preferred Stock

1971-75: Equity Capital - Preferred Stock

TABLE A-2.2

December, 1928 - December, 1975

| | NOB | MIN | MEAN | MAX | STD. DEVIATION |
|---|---|---|---|---|---|
| PAS1 | 565 | Ø.963849 | 2.74 | 5.2161 | Ø.789133 |
| PAS2 | 565 | 1.88398 | 4.41295 | 8.78689 | 1.9Ø[illegible]9 |
| PAS2.1 | 565 | Ø.317699 | Ø.799113 | 2.15518 | Ø.354896 |
| PAS2.2 | 565 | Ø.Ø37568 | Ø.263428 | Ø.856792 | Ø.24Ø562 |
| PAS2.3 | 565 | Ø.Ø1216 | Ø.1454Ø5 | Ø.739492 | Ø.139691 |
| PAS2.4 | 565 | Ø.823ØØ9 | 3.2Ø5 | 6.88891 | 1.73764 |
| PAS3 | 565 | Ø.Ø58865 | Ø.113387 | Ø.17747 | Ø.Ø35Ø1 |
| PAS4 | 565 | Ø.Ø11864 | Ø.174146 | Ø.6ØØ683 | Ø.1271Ø6 |
| PAS5 | 565 | Ø.Ø29888 | Ø.13818 | Ø.9Ø9175 | Ø.13953 |
| PAS6 | 565 | Ø.875Ø6 | 3.48679 | 9.27925 | 1.977Ø1 |
| PAS6.1 | 565 | Ø.4Ø6633 | 2.64Ø54 | 8.738Ø5 | 2.1Ø126 |
| PAS6.1.1 | 565 | Ø.ØØ9851 | Ø.521561 | 2.88411 | Ø.582136 |
| PAS6.1.2 | 565 | Ø.396782 | 2.11898 | 6.68858 | 1.62Ø43 |
| PAS6.2 | 565 | Ø.Ø6949 | Ø.572756 | 1.24782 | Ø.335842 |
| PAS6.3 | 565 | Ø.Ø71952 | Ø.273537 | Ø.5Ø3641 | Ø.13Ø445 |
| PLB1 | 565 | 3.3Ø223 | 7.7Ø418 | 13.6165 | 2.35886 |
| PLB2 | 565 | Ø.379987 | 1.5832 | 5.52759 | 1.33784 |
| PLB3 | 565 | Ø. | Ø.229333 | 1.61777 | Ø.376579 |
| PLB4 | 565 | Ø.Ø14335 | Ø.183375 | Ø.656814 | Ø.133Ø28 |
| PLB5 | 565 | Ø.Ø49138 | Ø.365366 | 2.38182 | Ø.387914 |

TABLE A-2.3

December, 1928 - December, 1975

| Variable | NOB | MIN | MEAN | MAX | STD. DEVIATION |
|---|---|---|---|---|---|
| QAS1 | 565 | 0.15455 | 0.247966 | 0.432111 | 0.051882 |
| QAS2 | 565 | 0.166833 | 0.397736 | 0.592495 | 0.131134 |
| QAS2.1 | 565 | 0.027198 | 0.083102 | 0.319267 | 0.061516 |
| QAS2.2 | 565 | 0.002433 | 0.022514 | 0.06321 | 0.017414 |
| QAS2.3 | 565 | 0.000791 | 0.013194 | 0.049118 | 0.010837 |
| QAS2.4 | 565 | 0.0936 | 0.278925 | 0.464515 | 0.122178 |
| QAS3 | 565 | 0.005088 | 0.011377 | 0.029672 | 0.006179 |
| QAS4 | 565 | 0.000779 | 0.017408 | 0.066502 | 0.014474 |
| QAS5 | 565 | 0.002363 | 0.012223 | 0.064578 | 0.010053 |
| QAS6 | 565 | 0.115663 | 0.31329 | 0.624098 | 0.13681 |
| QAS6.1 | 565 | 0.027009 | 0.234795 | 0.587698 | 0.150088 |
| QAS6.1.1 | 565 | 0.000654 | 0.045268 | 0.199917 | 0.041232 |
| QAS6.1.2 | 565 | 0.026355 | 0.189527 | 0.439147 | 0.119005 |
| QAS6.2 | 565 | 0.01123 | 0.050214 | 0.103564 | 0.024805 |
| QAS6.3 | 565 | 0.006087 | 0.028283 | 0.078803 | 0.020012 |
| QLB1 | 565 | 0.399763 | 0.699715 | 0.884977 | 0.138511 |
| QLB2 | 565 | 0.030589 | 0.136032 | 0.372722 | 0.097171 |
| QLB3 | 565 | 0. | 0.01824 | 0.113737 | 0.02737 |
| QLB4 | 565 | 0.000941 | 0.018312 | 0.069319 | 0.015016 |
| QLB5 | 565 | 0.006837 | 0.030724 | 0.167615 | 0.027439 |

TABLE A-2.3

RANGE 1928 12 1975 12 CORRELATION MATRIX

| | PAS | PAS1 | PAS2 | PAS2.1 | PAS2.2 | PAS2.3 | PAS2.4 | PAS3 | PAS4 | PAS5 | PAS6 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PAS | 1.000 | | | | | | | | | | |
| PAS1 | 0.697 | 1.000 | | | | | | | | | |
| PAS2 | 0.547 | 0.235 | 1.000 | | | | | | | | |
| PAS2.1 | -0.417 | -0.596 | -0.343 | 1.000 | | | | | | | |
| PAS2.2 | 0.458 | 0.230 | 0.920 | -0.328 | 1.000 | | | | | | |
| PAS2.3 | 0.268 | 0.013 | 0.799 | -0.246 | 0.825 | 1.000 | | | | | |
| PAS2.4 | 0.602 | 0.347 | 0.978 | -0.516 | 0.873 | 0.734 | 1.000 | | | | |
| PAS3 | -0.339 | -0.084 | -0.193 | 0.090 | 0.139 | 0.010 | -0.251 | 1.000 | | | |
| PAS4 | -0.062 | -0.239 | 0.672 | 0.032 | 0.690 | 0.752 | 0.576 | 0.142 | 1.000 | | |
| PAS5 | 0.362 | 0.135 | 0.788 | -0.231 | 0.879 | 0.781 | 0.729 | 0.183 | 0.757 | 1.000 | |
| PAS6 | 0.456 | 0.273 | -0.455 | 0.048 | -0.503 | -0.539 | -0.397 | -0.253 | -0.754 | -0.474 | 1.000 |
| PAS6.1 | 0.372 | 0.209 | -0.526 | 0.095 | -0.587 | -0.586 | -0.470 | -0.275 | -0.771 | -0.532 | 0.993 |
| PAS6.1.1 | 0.380 | 0.004 | -0.339 | 0.190 | -0.381 | -0.405 | -0.326 | -0.176 | -0.518 | -0.336 | 0.872 |
| PAS6.1.2 | 0.346 | 0.270 | -0.561 | 0.054 | -0.625 | -0.614 | -0.492 | -0.294 | -0.814 | -0.570 | 0.974 |
| PAS6.2 | 0.506 | 0.314 | 0.866 | -0.427 | 0.875 | 0.599 | 0.870 | 0.050 | 0.493 | 0.633 | -0.393 |
| PAS6.3 | -0.387 | -0.039 | -0.648 | 0.304 | -0.421 | -0.276 | -0.694 | 0.481 | -0.278 | -0.239 | 0.173 |
| PLB1 | 0.665 | 0.556 | -0.209 | -0.190 | -0.347 | -0.426 | -0.109 | -0.443 | -0.702 | -0.378 | 0.910 |
| PLB2 | 0.471 | 0.194 | 0.919 | -0.316 | 0.979 | 0.844 | 0.872 | 0.077 | 0.711 | 0.861 | -0.471 |
| PLB3 | 0.435 | 0.216 | 0.792 | -0.228 | 0.878 | 0.895 | 0.723 | 0.131 | 0.680 | 0.879 | -0.403 |
| PLB4 | -0.057 | -0.233 | 0.668 | 0.025 | 0.692 | 0.760 | 0.573 | 0.148 | 0.999 | 0.773 | -0.747 |
| PLB5 | 0.446 | 0.366 | 0.671 | -0.265 | 0.632 | 0.292 | 0.681 | 0.046 | 0.406 | 0.574 | -0.291 |

RANGE 1928 12 1975 12 CORRELATION MATRIX

| | PAS6.1 | PAS6.1.1 | PAS6.1.2 | PAS6.2 | PAS6.3 | PLB1 | PLB2 | PLB3 | PLB4 | PLB5 |
|---|---|---|---|---|---|---|---|---|---|---|
| PAS6.1 | 1.000 | | | | | | | | | |
| PAS6.1.1 | 0.870 | 1.000 | | | | | | | | |
| PAS6.1.2 | 0.984 | 0.769 | 1.000 | | | | | | | |
| PAS6.2 | -0.490 | -0.325 | -0.519 | 1.000 | | | | | | |
| PAS6.3 | 0.202 | 0.043 | 0.246 | -0.631 | 1.000 | | | | | |
| PLB1 | 0.888 | 0.715 | 0.894 | -0.185 | -0.037 | 1.000 | | | | |
| PLB2 | -0.552 | -0.342 | -0.593 | 0.864 | -0.459 | -0.329 | 1.000 | | | |
| PLB3 | -0.470 | -0.299 | -0.501 | 0.624 | -0.147 | -0.298 | 0.865 | 1.000 | | |
| PLB4 | -0.764 | -0.516 | -0.805 | 0.481 | -0.256 | -0.697 | 0.714 | 0.692 | 1.000 | |
| PLB5 | -0.350 | -0.221 | -0.375 | 0.670 | -0.487 | -0.086 | 0.540 | 0.453 | 0.392 | 1.000 |

TABLE A-2.4

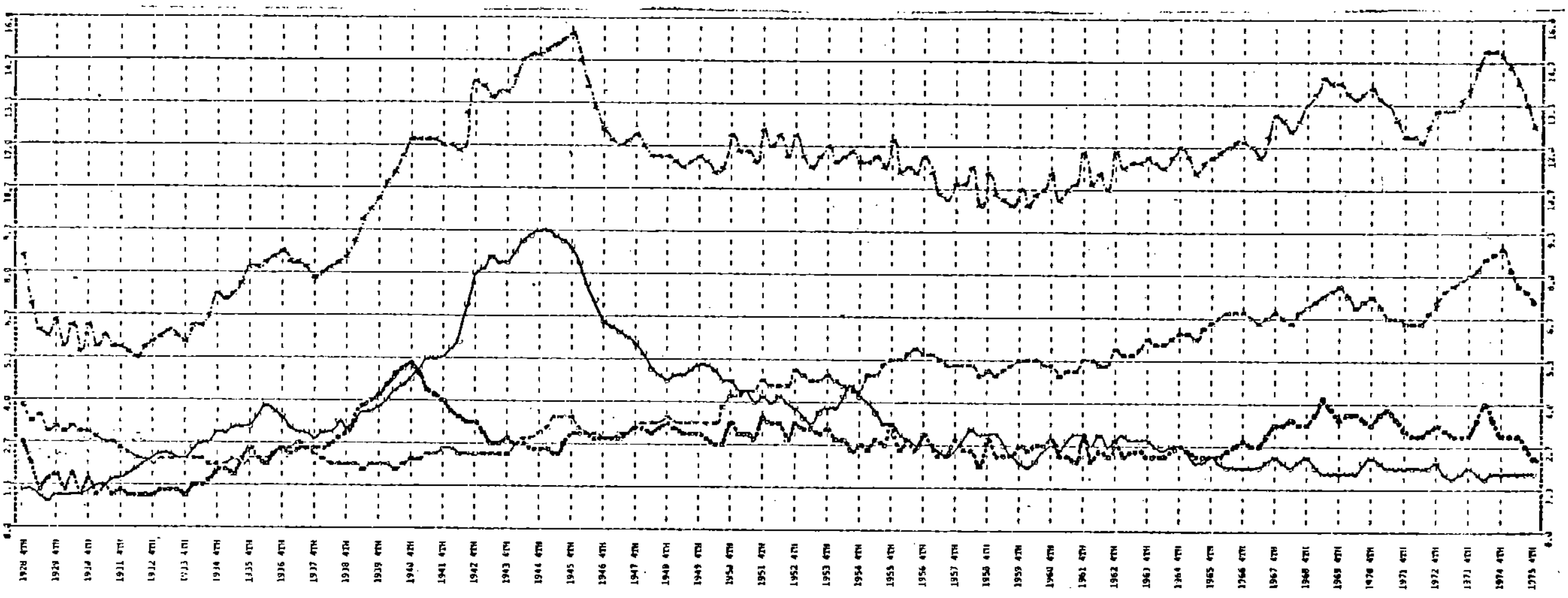
RANGE 1928 12 1975 12 CORRELATION MATRIX

| | QEQ | QAS1 | QAS2 | QAS2.1 | QAS2.2 | QAS2.3 | QAS2.4 | QAS3 | QAS4 | QAS5 | QAS6 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| QEQ | 1.000 | | | | | | | | | | |
| QAS1 | -0.094 | 1.000 | | | | | | | | | |
| QAS2 | -0.018 | -0.377 | 1.000 | | | | | | | | |
| QAS2.1 | 0.864 | -0.240 | 0.012 | 1.000 | | | | | | | |
| QAS2.2 | -0.296 | -0.222 | 0.821 | -0.281 | 1.000 | | | | | | |
| QAS2.3 | 0.087 | -0.364 | 0.800 | 0.053 | 0.722 | 1.000 | | | | | |
| QAS2.4 | -0.420 | -0.220 | 0.879 | -0.455 | 0.816 | 0.640 | 1.000 | | | | |
| QAS3 | 0.838 | 0.050 | -0.127 | 0.656 | -0.116 | 0.040 | -0.454 | 1.000 | | | |
| QAS4 | 0.602 | -0.347 | 0.648 | 0.627 | 0.363 | 0.650 | 0.271 | 0.420 | 1.000 | | |
| QAS5 | -0.022 | -0.292 | 0.717 | -0.005 | 0.820 | 0.722 | 0.591 | 0.109 | 0.589 | 1.000 | |
| QAS6 | -0.047 | 0.038 | -0.931 | -0.016 | -0.797 | -0.752 | -0.811 | 0.005 | -0.658 | -0.717 | 1.000 |
| QAS6.1 | -0.102 | 0.040 | -0.917 | -0.051 | -0.809 | -0.749 | -0.777 | -0.086 | -0.672 | -0.726 | 0.992 |
| QAS6.1.1 | -0.133 | -0.343 | -0.623 | -0.008 | -0.512 | -0.507 | -0.546 | -0.075 | -0.442 | -0.443 | 0.809 |
| QAS6.1.2 | -0.083 | 0.169 | -0.941 | -0.062 | -0.843 | -0.769 | -0.791 | -0.082 | -0.694 | -0.762 | 0.971 |
| QAS6.2 | -0.322 | -0.152 | 0.697 | -0.392 | 0.838 | 0.459 | 0.786 | -0.129 | 0.163 | 0.515 | -0.660 |
| QAS6.3 | 0.844 | 0.153 | -0.350 | 0.762 | -0.414 | -0.093 | -0.692 | 0.838 | 0.336 | -0.099 | 0.211 |
| QLB1 | 0.052 | 0.294 | -0.895 | 0.028 | -0.942 | -0.809 | -0.769 | -0.036 | -0.632 | -0.880 | 0.879 |
| QLB2 | -0.291 | -0.285 | 0.841 | -0.253 | 0.971 | 0.750 | 0.826 | -0.166 | 0.417 | 0.798 | -0.794 |
| QLB3 | -0.324 | -0.175 | 0.671 | -0.237 | 0.844 | 0.781 | 0.650 | -0.175 | 0.352 | 0.814 | -0.666 |
| QLB4 | 0.605 | -0.344 | 0.643 | 0.627 | 0.364 | 0.655 | 0.264 | 0.429 | 0.999 | 0.601 | -0.655 |
| QLB5 | -0.334 | -0.009 | 0.537 | -0.295 | 0.599 | 0.194 | 0.622 | -0.206 | 0.154 | 0.495 | -0.555 |

RANGE 1928 12 1975 12 CORRELATION MATRIX

| | QAS6.1 | QAS6.1.1 | QAS6.1.2 | QAS6.2 | QAS6.3 | QLB1 | QLB2 | QLB3 | QLB4 | QLB5 |
|---|---|---|---|---|---|---|---|---|---|---|
| QAS6.1 | 1.000 | | | | | | | | | |
| QAS6.1.1 | 0.813 | 1.000 | | | | | | | | |
| QAS6.1.2 | 0.979 | 0.679 | 1.000 | | | | | | | |
| QAS6.2 | -0.696 | -0.454 | -0.720 | 1.000 | | | | | | |
| QAS6.3 | 0.147 | -0.002 | 0.187 | -0.534 | 1.000 | | | | | |
| QLB1 | 0.893 | 0.573 | 0.927 | -0.742 | 0.239 | 1.000 | | | | |
| QLB2 | -0.799 | -0.491 | -0.838 | 0.818 | -0.445 | -0.947 | 1.000 | | | |
| QLB3 | -0.656 | -0.416 | -0.683 | 0.527 | -0.286 | -0.830 | 0.828 | 1.000 | | |
| QLB4 | -0.669 | -0.443 | -0.690 | 0.154 | 0.348 | -0.631 | 0.417 | 0.359 | 1.000 | |
| QLB5 | -0.542 | -0.349 | -0.563 | 0.592 | -0.458 | -0.578 | 0.503 | 0.421 | 0.144 | 1.000 |

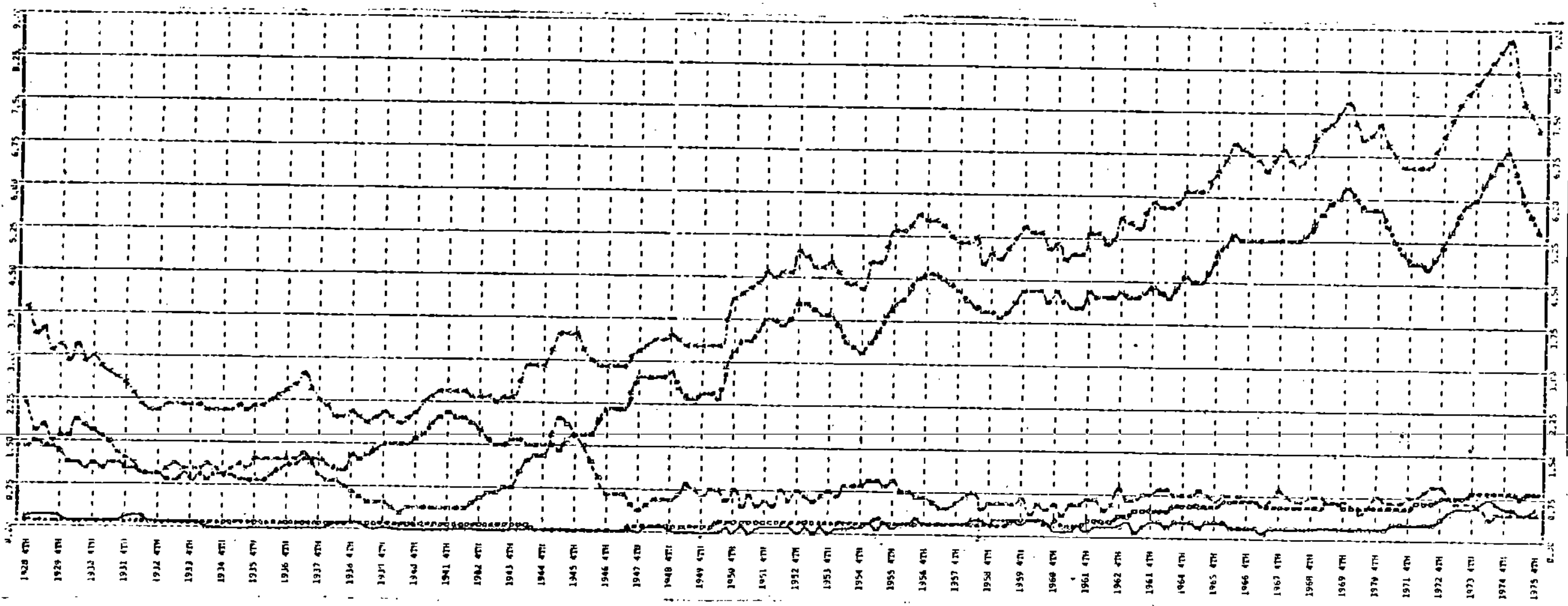
FIGURE A-2.1



| | |
|---|---|
| —·—· $\frac{\text{Total assets}}{\text{Capital}}$ | ••• $\frac{\text{Cash}}{\text{Capital}}$ |
| – – – – $\frac{\text{Loans}}{\text{Capital}}$ | —— $\frac{\text{Securities}}{\text{Capital}}$ |

Legend is top to bottom in order of finish

FIGURE A-2.2



Loans / Capital

Loans on Securities / Capital

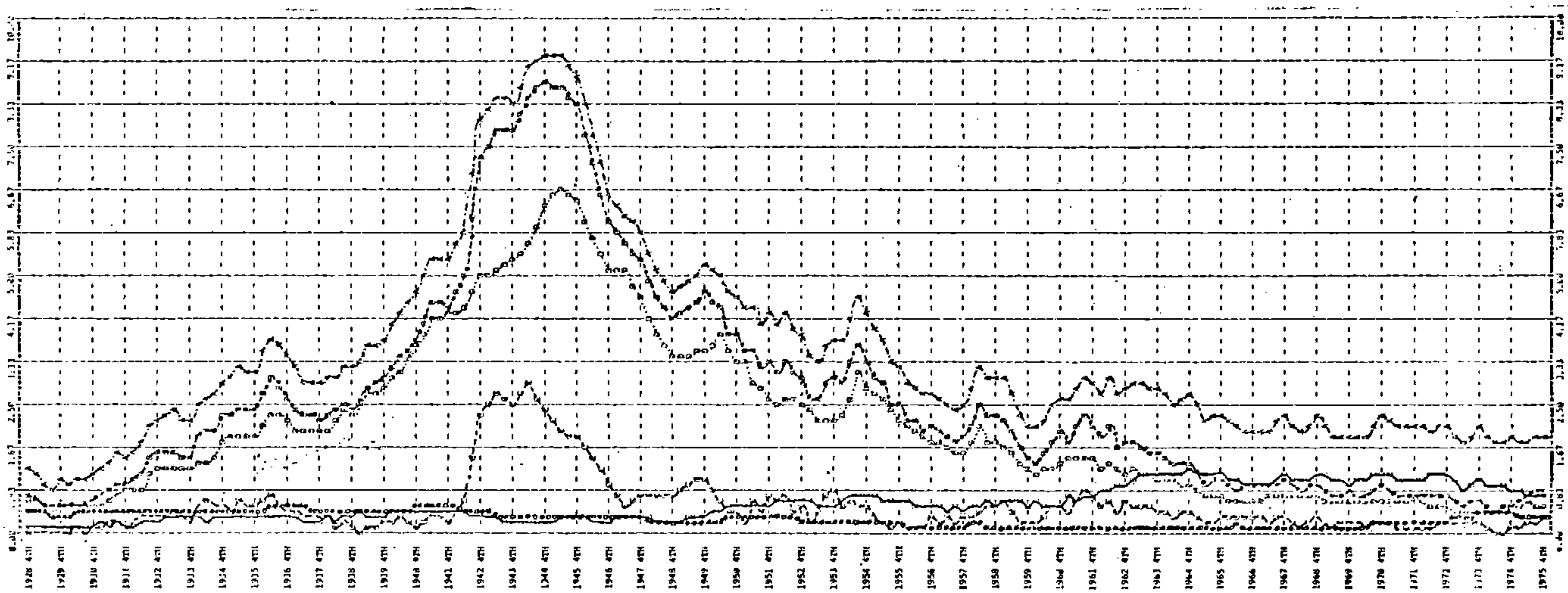
Real Estate Loans / Capital

Loans to Banks / Capital

Other Loans / Capital

Legend is top to bottom in order of finish

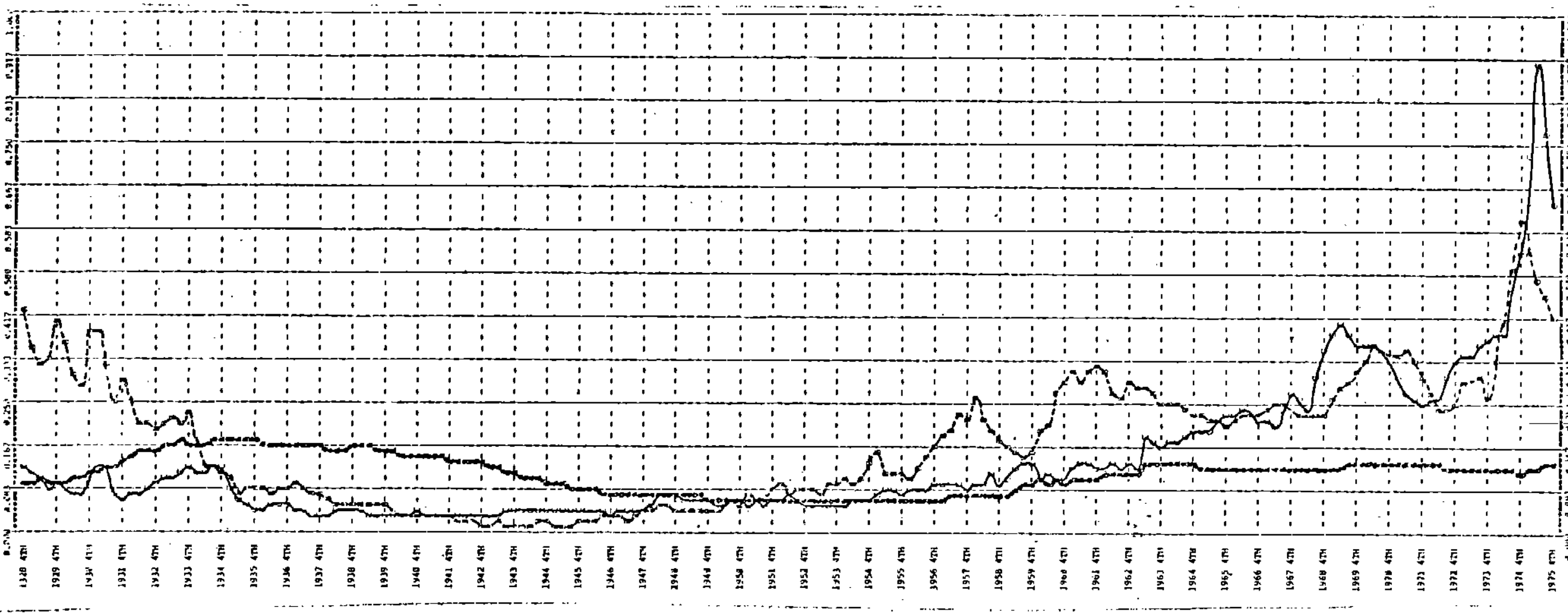
FIGURE A-2.3



| | |
|---|---|
| — · — · — | Investments / Capital |
| —o—o— | U.S. Treasury Securities / Capital |
| ——— | State and Municipal Securities / Capital |
| ······ | U.S. Treasury Notes and Bonds / Capital |
| - - - - | U.S. Treasury Bills and Certificates / Capital |
| ooooo | Other Securities / Capital |

Legend is top to bottom in order of finish

FIGURE A-2.4



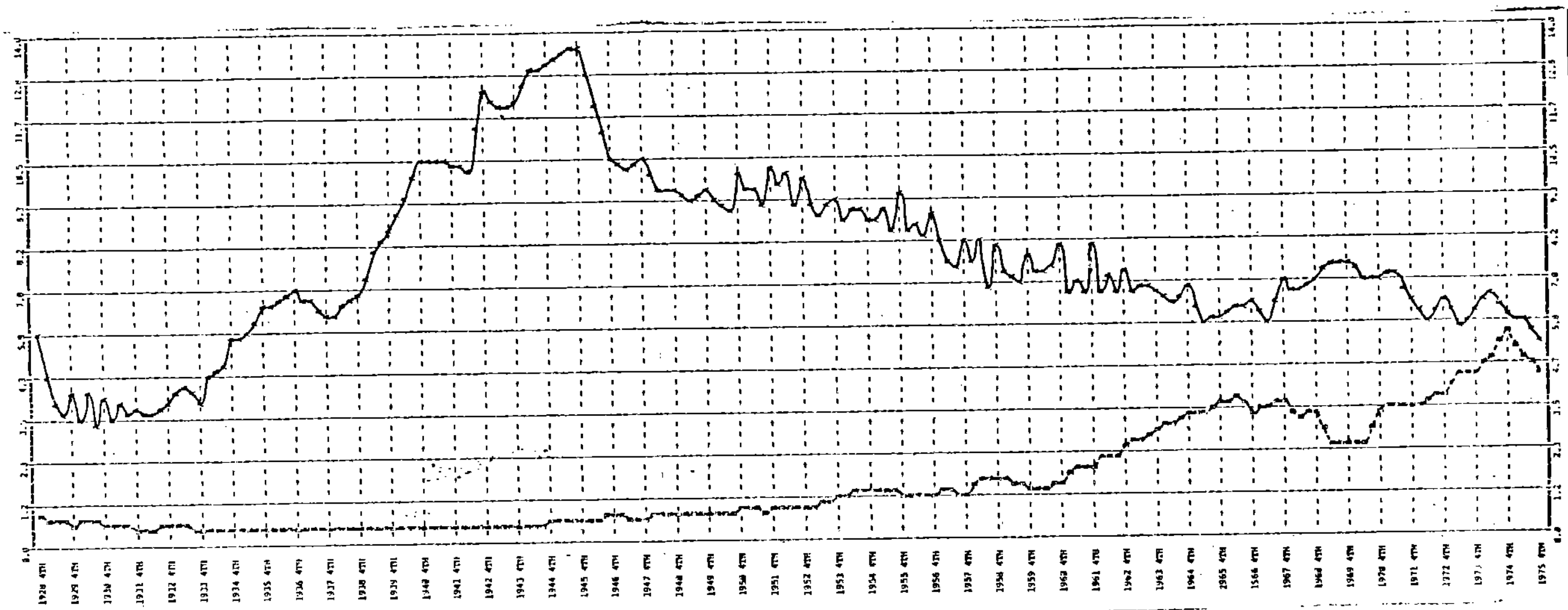
——— $\frac{\text{Other Assets}}{\text{Capital}}$

ooooo $\frac{\text{Fixed Assets}}{\text{Capital}}$

– – – $\frac{\text{Customer's Liability on Acceptances Outstanding}}{\text{Capital}}$

Legend is top to bottom in order of finish

FIGURE A-2.5

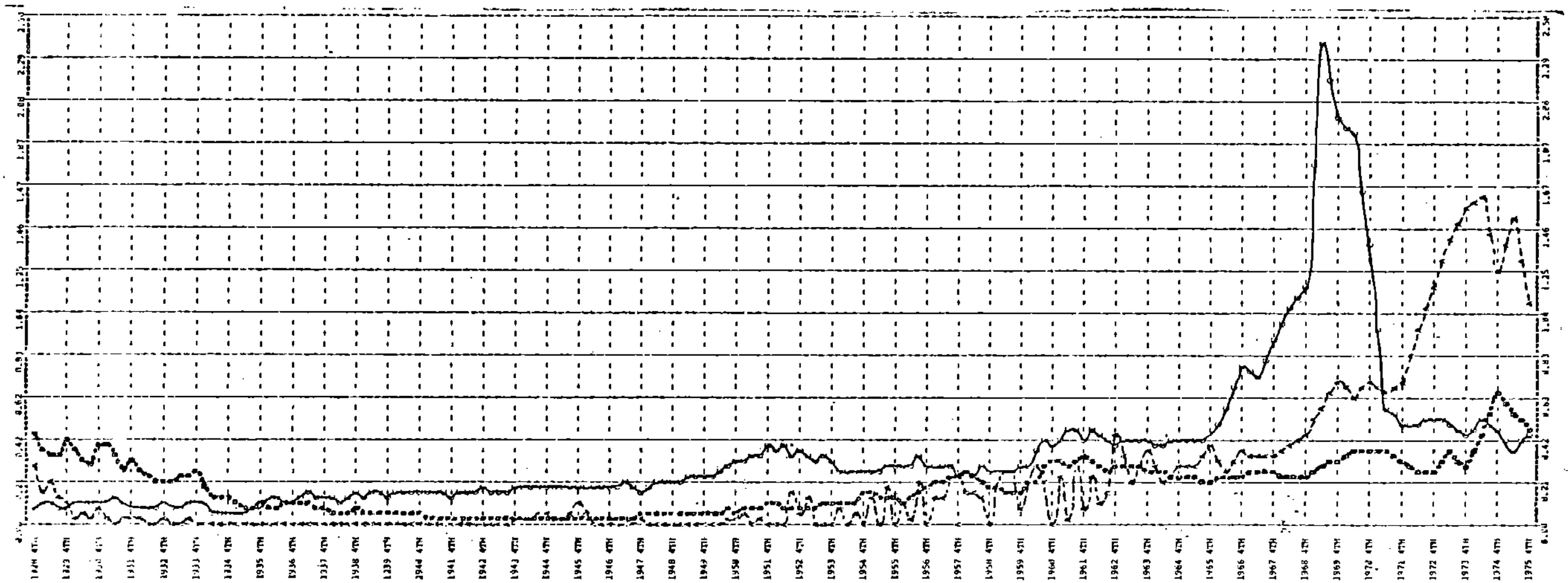


Demand Deposits / Capital (solid line)

Time Deposits / Capital (dashed line)

Legend is top to bottom in order of finish

FIGURE A-2.6



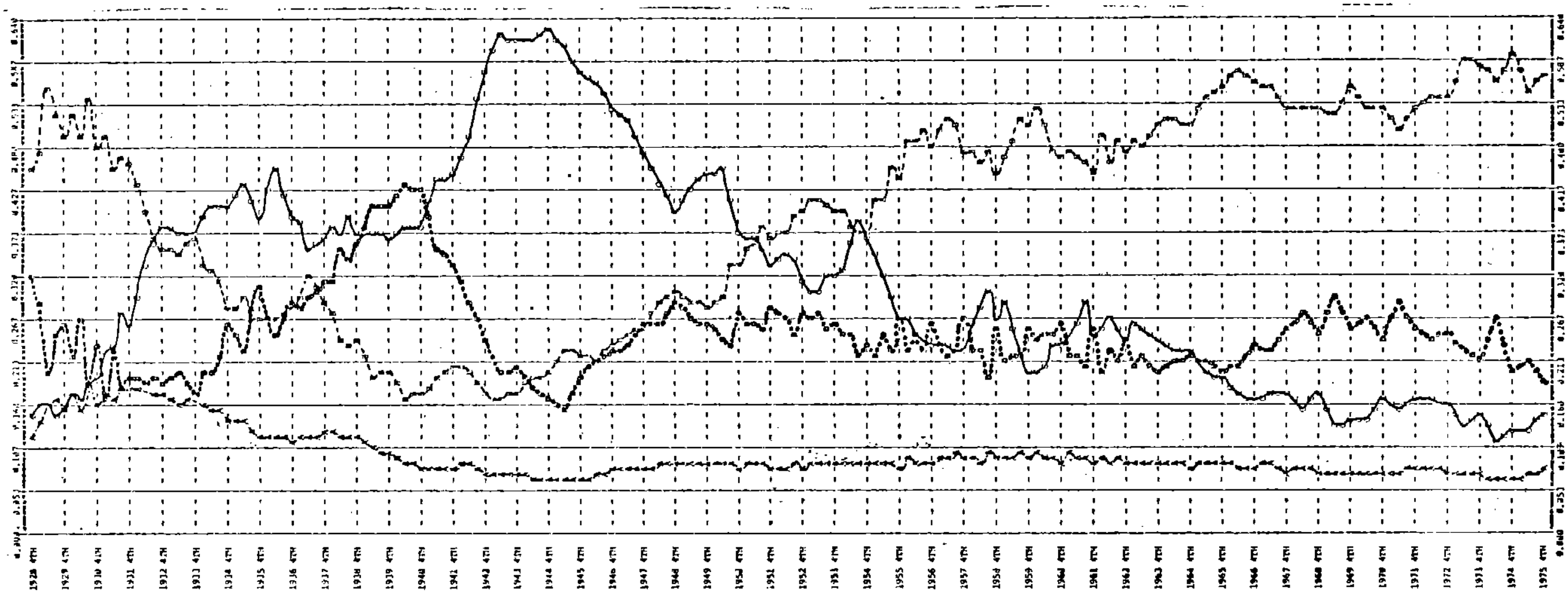
Borrowings / Capital (dashed line)

Acceptances Outstanding / Capital (ooooo)

Other Liabilities / Capital (solid line)

Legend is top to bottom in order of finish

FIGURE A-2.7



Loans / Total Assets (dashed line)

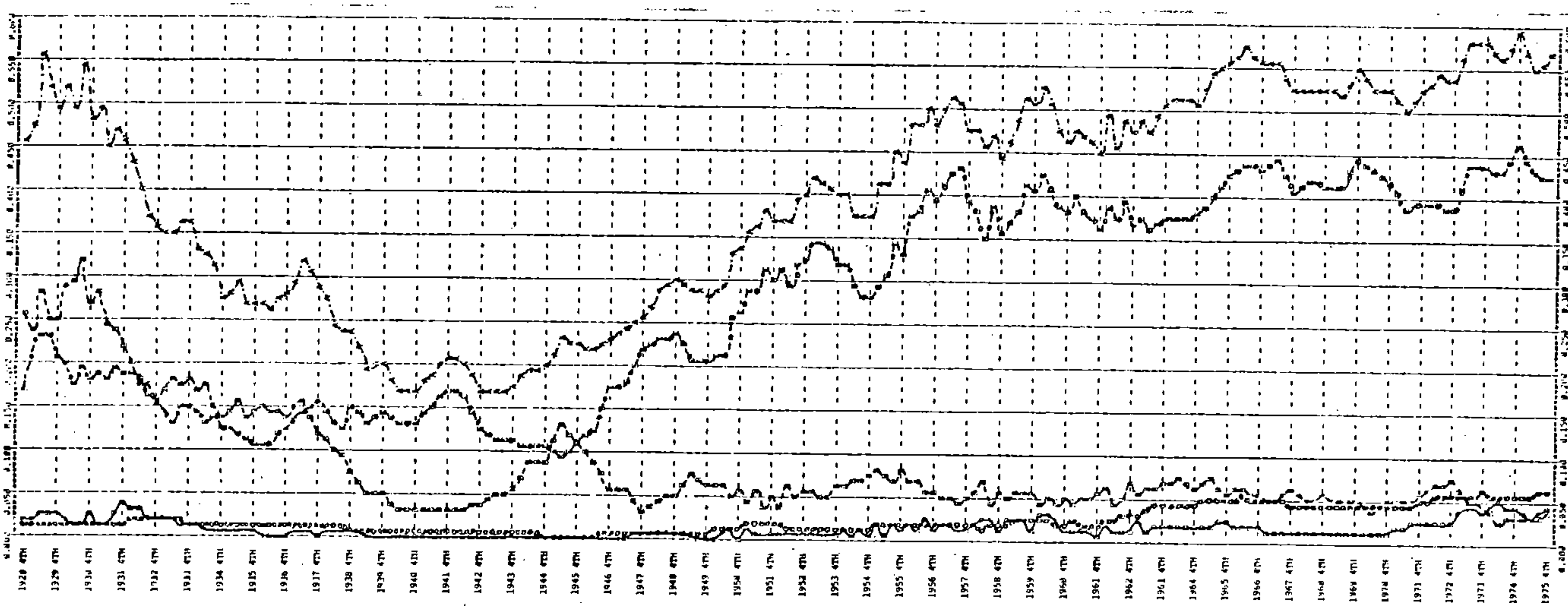
Cash / Total Assets (circles)

Securities / Total Assets (solid line)

Capital / Total Assets (dash-dot line)

Legend is top to bottom in order of finish

FIGURE A-2.8



— · — · Loans / Total Assets

— — — Loans on Securities / Total Assets

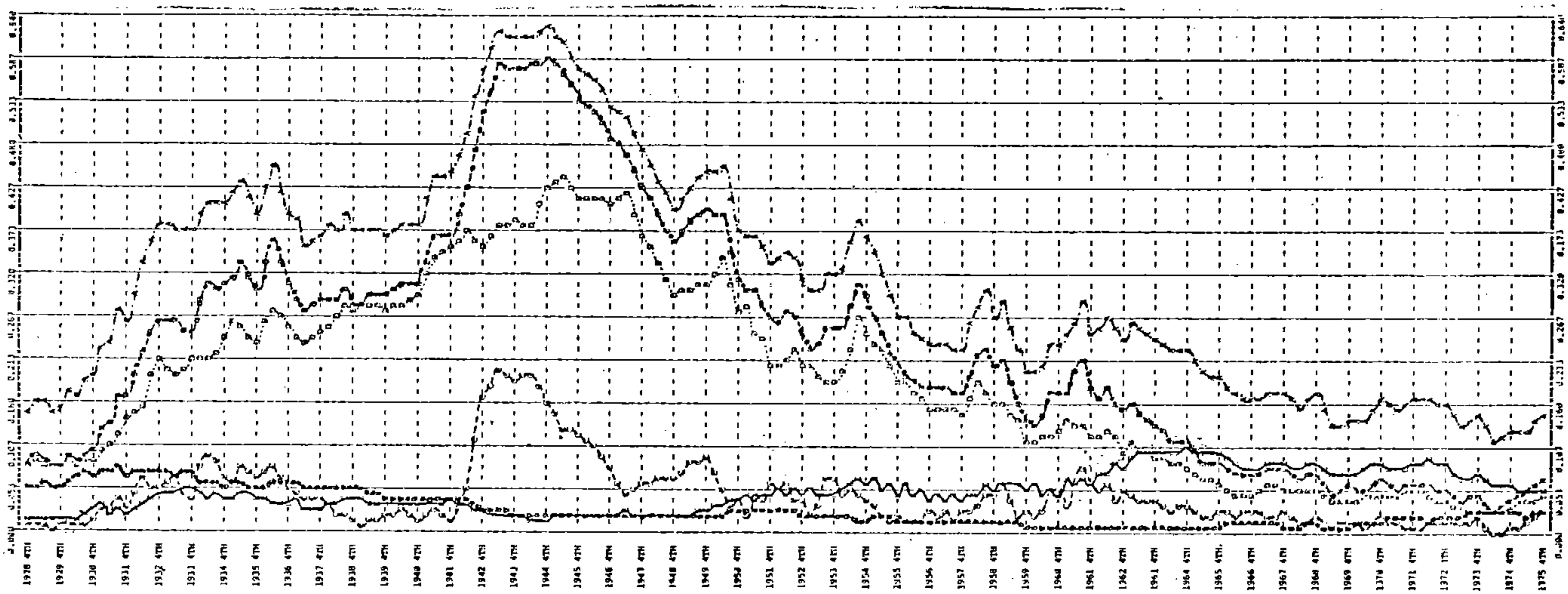
ooooo Real Estate Loans / Total Assets

——— Loans to Banks / Total Assets

—o—•— Other Loans / Total Assets

Legend is top to bottom in order of finish

FIGURE A-2.9



Investments / Total Assets

U.S. Treasury Securities / Total Assets

State and Municipal Securities / Total Assets

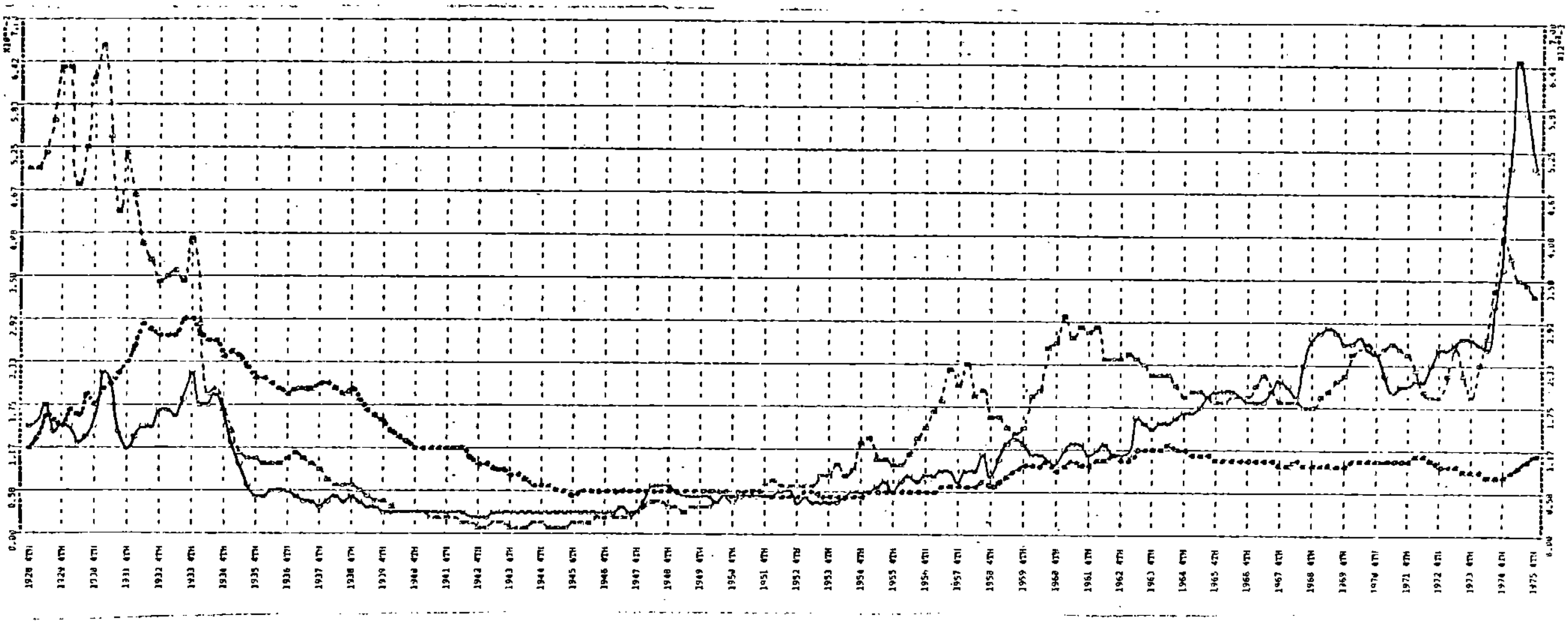
U.S. Treasury Notes and Bonds / Total Assets

U.S. Treasury Bills and Certificates / Total Assets

Other Securities / Other Assets

Legend is top to bottom in order of finish

FIGURE A-2.10



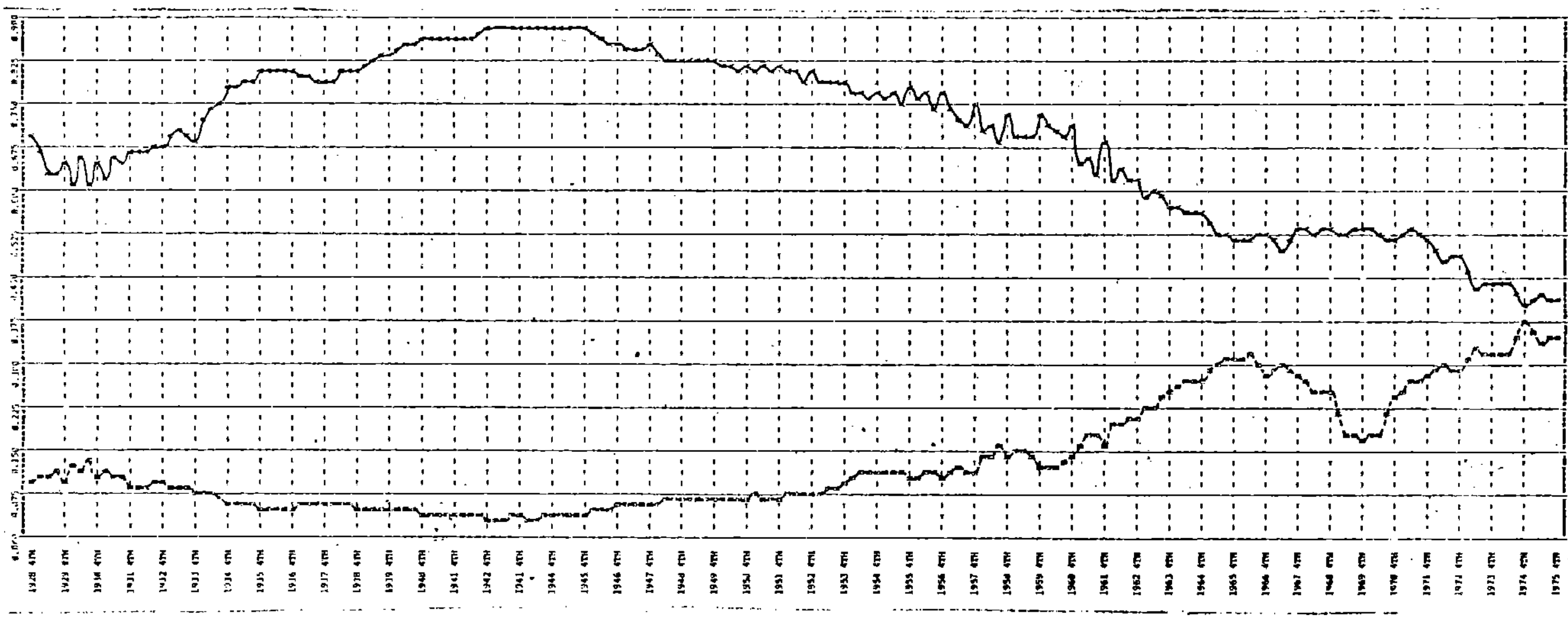

——— Other Assets / Total Assets

ooooo Fixed Assets / Total Assets

– – – Customer's Liability on Acceptances Outstanding / Total Assets

Legend is top to bottom in order of finish

FIGURE A-2.11

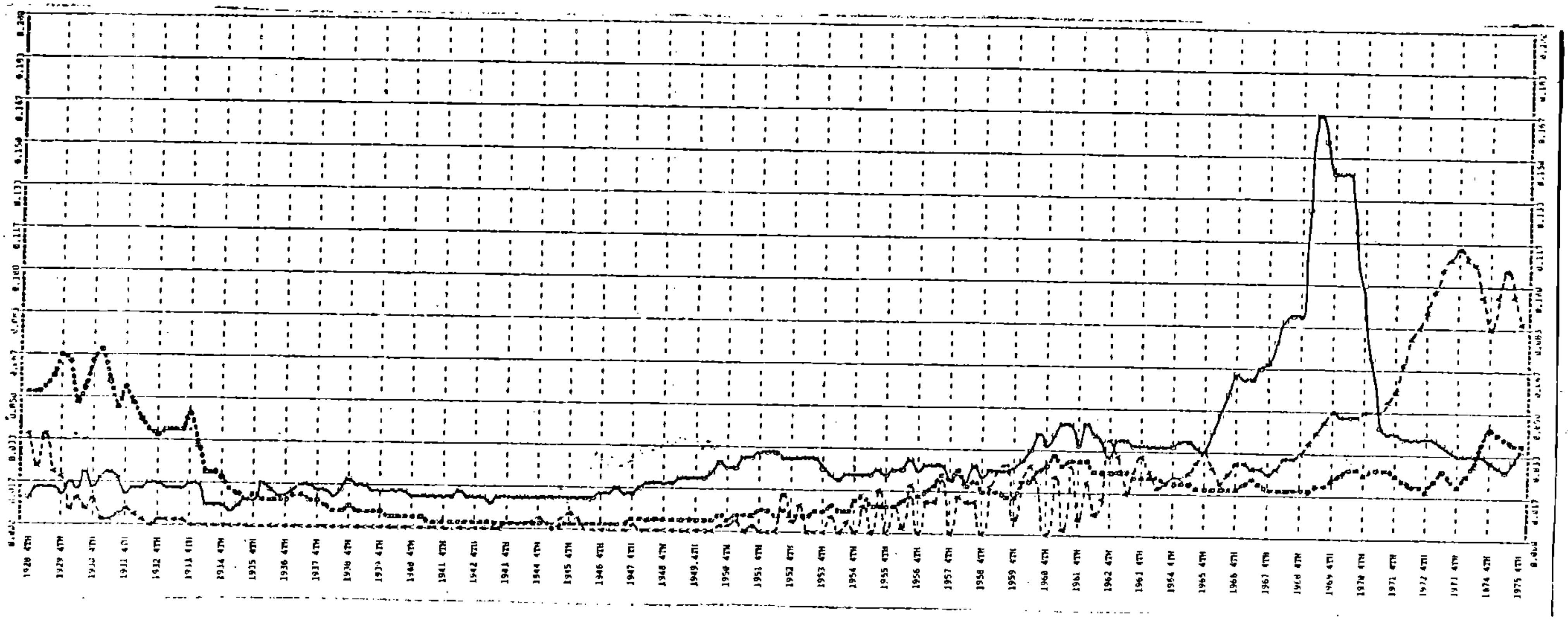


——— Demand Deposits / Total Assets

– – – Time Deposits / Total Assets

Legend is top to bottom in order of finish

FIGURE A-2.12



– – – – Borrowings / Total Assets

——— Other Liabilities / Total Assets

oooooo Acceptances Outstanding / Total Assets

Legend is top to bottom in order of finish

SECTION A-3

## Historical Perspective on Book Value/Market Value of Capital and "Classical" Measure of Capital Adequacy

The standard measure of capital adequacy compare book values from the bank's balance sheet. This section provides a historical perspective on the relationship between book values and market values of equity over time. We have computed the measure of market value to book value of equity for a group of New York Banks from 1929 through 1975 and for a group of Banks Outside New York City for the years 1957-1975. For the New York City banks we present a graphical review of the classical measures of capital adequacy and calculate related measures using surrogates for market values.

The banks chosen for computing the book value to market value ratio were those used in Standard and Poor's New York City Bank Index and Standard and Poor's Outside New York City Bank Index. These are listed in Section A-1, Table A-1.1. The New York City index contains 17 banks in 1929 and reduces to 9 by 1975. The Outside New York index contains 10 banks in 1950, increases to 17 in 1956 and decreases to 16 banks by 1975. These banks were chosen because they are actively traded throughout the period they are in the index.

The book value of equity, the number of shares and the market value per share were gathered for each bank in the index in each year. The book value of equity and the number of shares were taken from Moody's Bank and Finance Manual. The book value of equity was computed as the book value of stock plus surplus plus undivided profits plus dividends declared but not yet paid. Book values of preferred stock and capital notes were not included. An attempt was made to include reserves for contingencies in the equity account. Since this could not always be sorted out from reserves for losses on securities or reserves for loan losses, judgment was used to decide how much of the item called "reserves" was reserves for contingencies. The market value per share was taken from the Bank and Quotation Record. Last trading day of the year figures were used to correspond with the year-end balance sheets obtained from Moody's manuals. Where no closing quote could be found, the bid and ask quotations were averaged. In the few cases where year end values could not be obtained, the values for the month before and month after were averaged. Book and market values for individual banks were then aggregated. The raw data are given in Table A-3.1 and graphed in Figure A-3.1 for the New York Banks. The raw data are given in Table A-3.2 for the Outside New York City Banks and graphed in Figure A-3.3. Where the book values appear to rise or drop sharply, banks have been added to or deleted from the index. The market value/book value ratio is given in Table A-3.2 for the New York Banks and graphed in Figure A.3.2. This ratio is given in Table A-3.2 for the Outside New York Banks and graphed in Figure A-3.4. Two of the banks in the Outside New York City Index were not included in the 1975 computations as their book values were not available. In Figure A-2.5 the movement of the ratio is graphed for the two groups of banks.

The balance sheet data (book values), compiled by the Board of Governors of the Federal Reserve System from individual bank call report data for the New York Reserve City member banks, were readily accessible in aggregated form. The exact derivation of the series is described in the previous section. The December call report data were used to compute measures of capital adequacy. Market value/book value ratios were compiled for the Standard and Poor's New York Banks as described above. The market value of equity for the New York City Banks was estimated by multiplying the Book

Value of the New York Banks times the Market Value/Book Value ratio for the Standard and Poor's New York banks.

The market value estimate for New York City Banks will be excellent, as banks in Standard and Poor's New York index correspond fairly closely to the Federal Reserve Board's classification of New York Central Reserve City Member Banks. Total deposit data were gathered for each bank in the Standard and Poor's index for the years 1930, 1940, 1950, 1960 and 1970 from Moody's Bank and Finance Manual. The deposit data were aggregated and compared with total deposits from the call report data of the New York Reserve city member banks. The results (in millions of dollars) were:

| Year | Standard and Poor's Banks Total Deposits (a) | New York Reserve City Member Banks Total Deposits (b) | (a) as a Percentage of (b) |
|---|---|---|---|
| 1930 | 9,184 | 9,602 | 95.6 |
| 1940 | 17,561 | 17,744 | 99.0 |
| 1950 | 25,789 | 28,954 | 89.1 |
| 1960 | 34,697 | 39,767 | 87.3 |
| 1970 | 88,807 | 89,384 | 99.4 |

This high degree of correspondence gives us confidence in our market value estimates of capital adequacy.

Two important comments are in order. First, the market value of capital refers to the market value of equity plus the book value of preferred stocks and notes. Second, the "market value" of assets was computed as the book value of assets plus the difference between the market and book values of equity. This is admittedly a very crude surrogate for the true market value of assets. It would only be correct if the economic value of deposits were equal to the nominal value. In fact, the economic value of deposits is generally less than the nominal value, hence our estimate overstates the true market value of assets.

All measures of capital adequacy are shown for the 1929-75 period in Figures A-3.6 - A-3.17. It is fairly clear why most of the measures are considered relevant for estimating capital adequacy. However, Figures A-3.13 and A-3.14 deserve some comment, as do Figures A-3.16 and A-3.17. In Figure A-3.13 (total assets, book - cash - U.S. government securities - agency securities)/6 is a rule of thumb estimate of a "proper" amount of capital.[3] Figure A-3.10 hence illustrates the ratio of this "proper" amount of capital to the actual amount of capital. Note that in calculating the measure, instead of agency securities (which were not available separately) the entire category of other securities was subtracted out. This includes stock, Federal Reserve stock, Federal agencies not guaranteed and investment in subsidiaries not consolidated. Thus our estimate of "proper capital" may be interpreted as a lower bound. Figure A-3.14 substitutes market values for book values. Peltzman[4] uses capital/(deposits - cash) as a proxy for capital adequacy. This measure is shown in Figure A-3.16. It may be viewed as a measure of capital divided by uncovered deposits. We felt that other assets are almost as liquid as cash, and the distinction was artificial, so we used capital/deposits and graphed the results in Figure A-3.17.

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[3]This was mentioned by Sam Peltzman in his article "Capital Investment in Commercial Banking and Its Relationship to Portfolio Regulation," Journal of Political Economy (January/February, 1970), pp. 1-26.

[4]Ibid.

TABLE A-3.1

| YEAR | SPBV* | SPMV** | SPMVBV*** |
|---|---|---|---|
| 1929 | 1.656936E+06 | 4.940813E+06 | 2.9819 |
| 1930 | 1.837059E+06 | 3.243078E+06 | 1.76536 |
| 1931 | 1.753151E+06 | 1.609822E+06 | 0.918245 |
| 1932 | 1.640600E+06 | 1.857129E+06 | 1.13198 |
| 1933 | 1.396356E+06 | 1.248121E+06 | 0.893842 |
| 1934 | 1.382839E+06 | 1.387796E+06 | 1.00358 |
| 1935 | 1.349600E+06 | 1.917882E+06 | 1.42107 |
| 1936 | 1.482918E+06 | 2.010281E+06 | 1.35563 |
| 1937 | 1.497633E+06 | 1.419060E+06 | 0.947535 |
| 1938 | 1.496044E+06 | 1.398756E+06 | 0.93497 |
| 1939 | 1.511118E+06 | 1.610458E+06 | 1.06574 |
| 1940 | 1.521599E+06 | 1.546625E+06 | 1.01645 |
| 1941 | 1.544623E+06 | 1.216697E+06 | 0.787698 |
| 1942 | 1.582801E+06 | 1.254058E+06 | 0.792303 |
| 1943 | 1.691342E+06 | 1.617260E+06 | 0.956199 |
| 1944 | 1.838213E+06 | 1.950484E+06 | 1.06108 |
| 1945 | 1.966301E+06 | 2.184589E+06 | 1.11101 |
| 1946 | 2.048311E+06 | 1.896942E+06 | 0.926101 |
| 1947 | 2.100521E+06 | 1.627318E+06 | 0.774721 |
| 1948 | 2.165878E+06 | 1.624060E+06 | 0.749839 |
| 1949 | 2.200832E+06 | 1.823572E+06 | 0.828583 |
| 1950 | 2.231080E+06 | 1.846732E+06 | 0.82773 |
| 1951 | 2.303039E+06 | 2.031093E+06 | 0.881919 |
| 1952 | 2.379472E+06 | 2.256017E+06 | 0.948117 |
| 1953 | 2.443165E+06 | 2.220914E+06 | 0.909032 |
| 1954 | 2.675661E+06 | 2.840741E+06 | 1.0617 |
| 1955 | 2.605877E+06 | 2.880512E+06 | 1.10539 |
| 1956 | 2.722461E+06 | 3.045519E+06 | 1.11866 |
| 1957 | 2.971976E+06 | 2.997642E+06 | 1.00864 |
| 1958 | 3.113908E+06 | 3.864051E+06 | 1.2409 |
| 1959 | 3.292294E+06 | 4.832571E+06 | 1.46784 |
| 1960 | 3.458638E+06 | 4.379224E+06 | 1.26617 |
| 1961 | 3.620352E+06 | 6.504983E+06 | 1.79678 |
| 1962 | 3.763842E+06 | 5.629105E+06 | 1.49557 |
| 1963 | 4.003850E+06 | 5.992963E+06 | 1.4968 |
| 1964 | 4.178700E+06 | 6.612901E+06 | 1.58253 |
| 1965 | 4.317183E+06 | 6.035296E+06 | 1.39797 |
| 1966 | 4.432778E+06 | 5.873577E+06 | 1.32503 |
| 1967 | 4.640223E+06 | 5.905689E+06 | 1.27272 |
| 1968 | 4.859268E+06 | 8.253512E+06 | 1.69851 |
| 1969 | 5.091627E+06 | 7.596241E+06 | 1.49191 |
| 1970 | 5.816027E+06 | 7.895430E+06 | 1.35753 |
| 1971 | 5.713914E+06 | 8.639913E+06 | 1.51208 |
| 1972 | 6.236175E+06 | 1.117685E+07 | 1.79226 |
| 1973 | 6.805123E+06 | 1.254017E+07 | 1.84275 |
| 1974 | 7.423931E+06 | 8.128644E+06 | 1.09492 |
| 1975 | 8.447314E+06 | 8.526424E+06 | 1.00937 |

*Book Value, Standard and Poor's New York Banks

**Market Value, Standard and Poor's New York Banks

***Market Value/Book Value, Standard and Poor's New York Banks

TABLE A-3.2

| YEAR | SPBVOB* | SPMVOB ** | SPMVBVOB *** |
|---|---|---|---|
| 1950 | 1.089879E+06 | 1.246693E+06 | 1.14388 |
| 1951 | 1.201762E+06 | 1.478192E+06 | 1.23002 |
| 1952 | 1.264874E+06 | 2.257290E+06 | 1.7846 |
| 1953 | 1.344183E+06 | 1.754793E+06 | 1.30547 |
| 1954 | 1.422102E+06 | 2.162327E+06 | 1.52051 |
| 1955 | 1.504556E+06 | 2.855636E+06 | 1.89799 |
| 1956 | 2.255574E+06 | 2.978659E+06 | 1.32058 |
| 1957 | 2.308168E+06 | 2.628227E+06 | 1.13866 |
| 1958 | 2.415376E+06 | 3.630649E+06 | 1.50314 |
| 1959 | 2.581802E+06 | 4.246410E+06 | 1.64475 |
| 1960 | 2.729950E+06 | 4.204025E+06 | 1.53996 |
| 1961 | 2.994091E+06 | 5.840809E+06 | 1.95078 |
| 1962 | 3.126553E+06 | 4.882648E+06 | 1.56167 |
| 1963 | 3.263033E+06 | 5.822805E+06 | 1.78448 |
| 1964 | 3.408402E+06 | 5.866124E+06 | 1.72108 |
| 1965 | 3.796178E+06 | 5.596673E+06 | 1.47429 |
| 1966 | 4.013779E+06 | 5.477937E+06 | 1.36478 |
| 1967 | 4.436864E+06 | 5.623505E+06 | 1.26745 |
| 1968 | 4.642316E+06 | 8.299930E+06 | 1.78788 |
| 1969 | 4.823488E+06 | 6.686943E+06 | 1.38633 |
| 1970 | 5.359296E+06 | 7.189130E+06 | 1.34143 |
| 1971 | 5.738024E+06 | 7.892708E+06 | 1.37551 |
| 1972 | 6.150132E+06 | 9.853587E+06 | 1.60217 |
| 1973 | 6.549137E+06 | 9.084702E+06 | 1.38716 |
| 1974 | 7.063135E+06 | 5.585768E+06 | 0.790834 |
| 1975 | 7.305087E+06 | 6.747852E+06 | 0.92372 |

*Book Value, Standard and Poor's Outside New York Banks

**Market Value, Standard and Poor's Outside New York Banks

***Market Value/Book Value, Standard and Poor's Outside New York Banks

FIGURE A-3.1

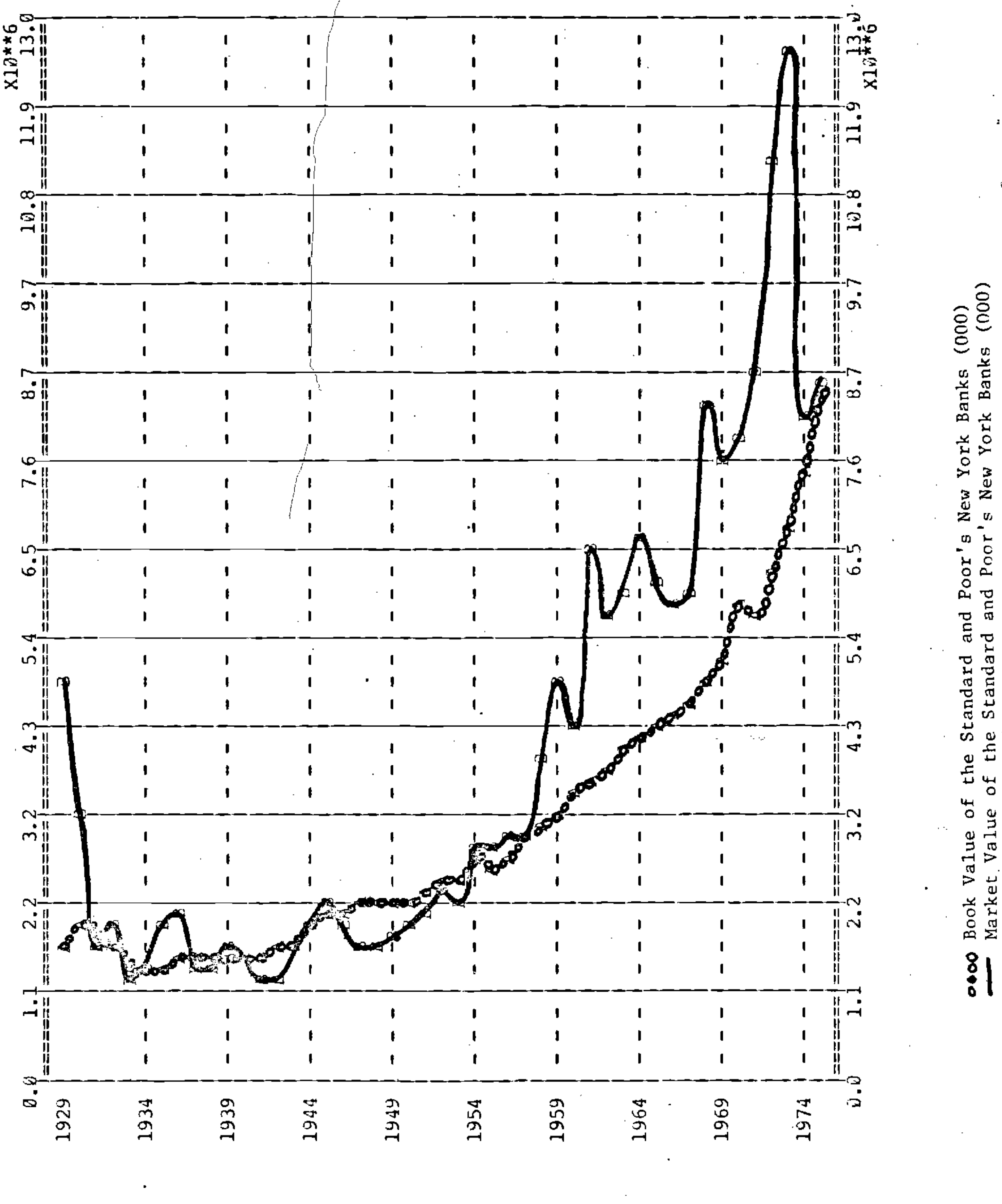
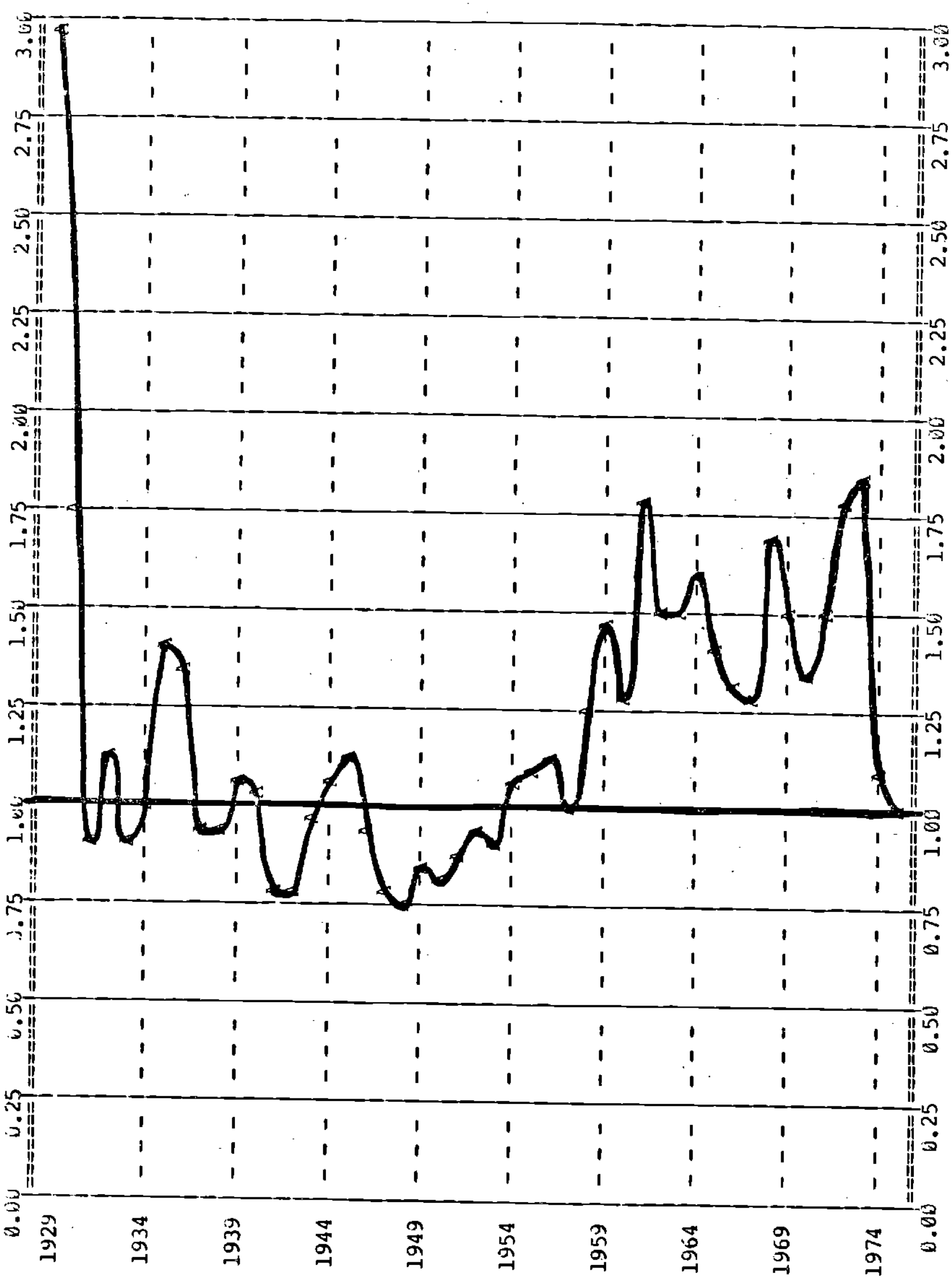
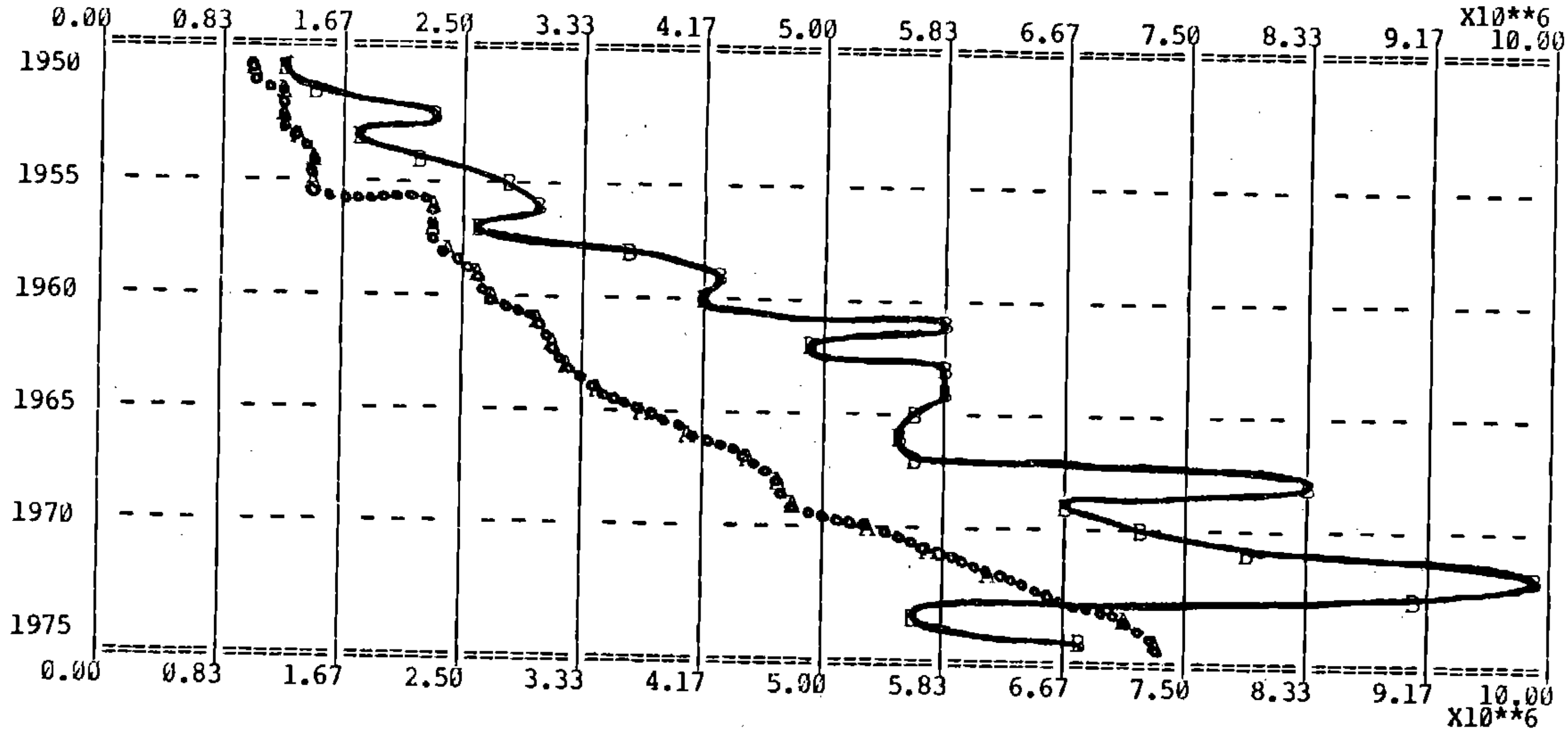

X10**6
0.0
1.1
2.2
3.2
4.3
5.4
6.5
7.6
8.7
9.7
10.8
11.9
13.0
1929
1934
1939
1944
1949
1954
1959
1964
1969
1974
Book Value of the Standard and Poor's New York Banks (000)
Market Value of the Standard and Poor's New York Banks (000)

FIGURE A-3.2



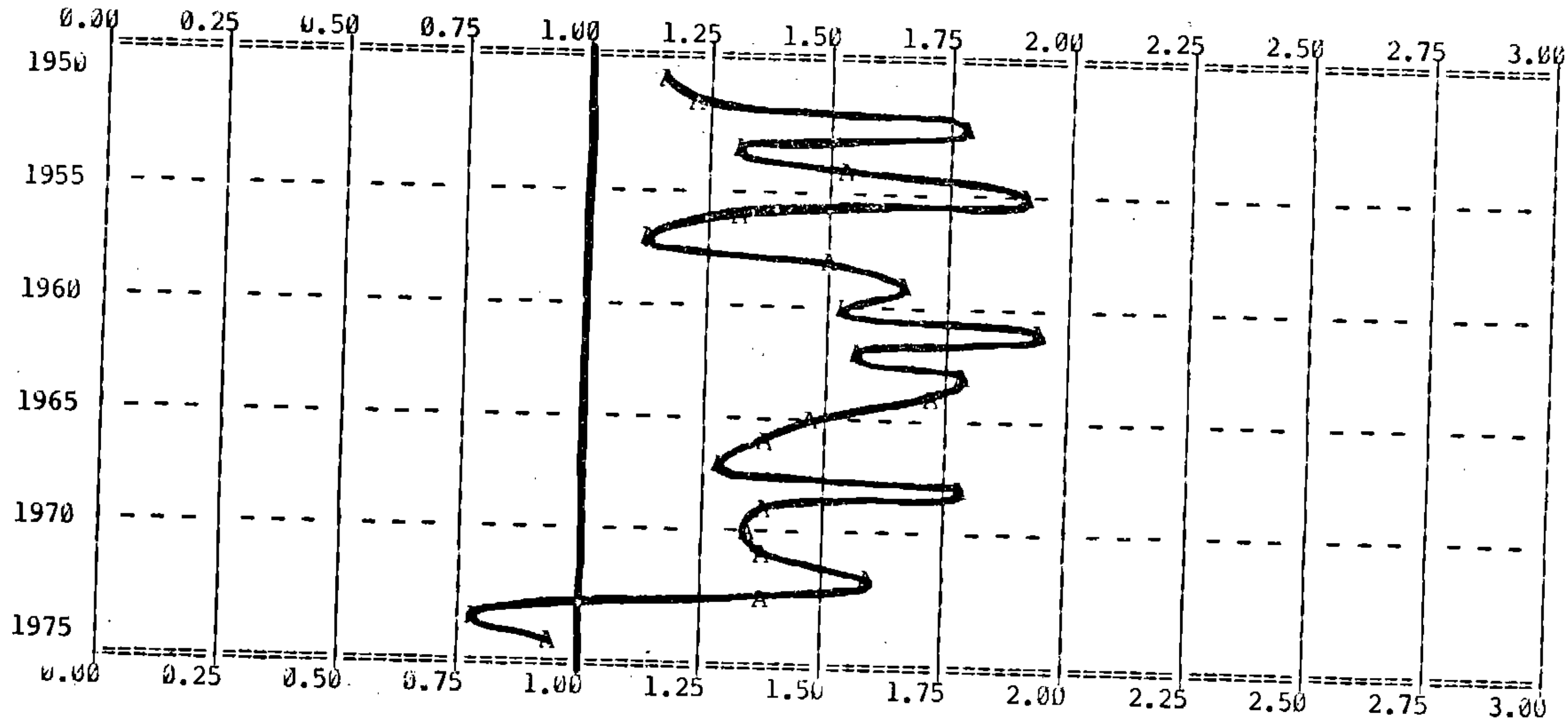

Market Value/Book Value of the Standard and Poor's New York Banks

FIGURE A-3.3




•••• Book Value of the Standard and Poor's New York Banks (000)
—— Market Value of the Standard and Poor's New York Banks (000)

FIGURE A-3.4




Market Value/Book Value of the Standard and Poor's Outside New York Banks

FIGURE A-3.5

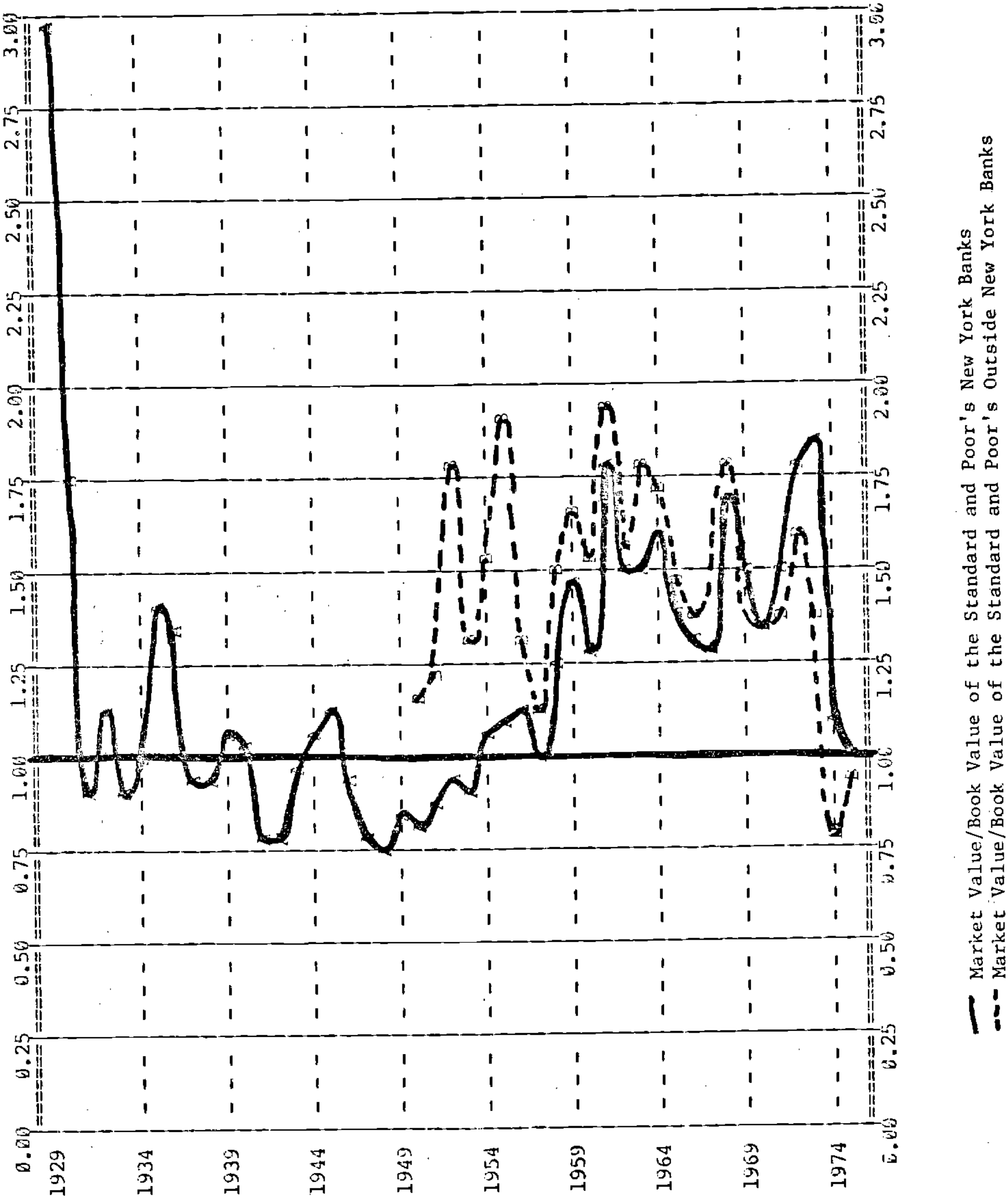

0.00
0.25
0.50
0.75
1.00
1.25
1.50
1.75
2.00
2.25
2.50
2.75
3.00
1929
1934
1939
1944
1949
1954
1959
1964
1969
1974
Market Value/Book Value of the Standard and Poor's New York Banks
Market Value/Book Value of the Standard and Poor's Outside New York Banks

FIGURE A-3.6

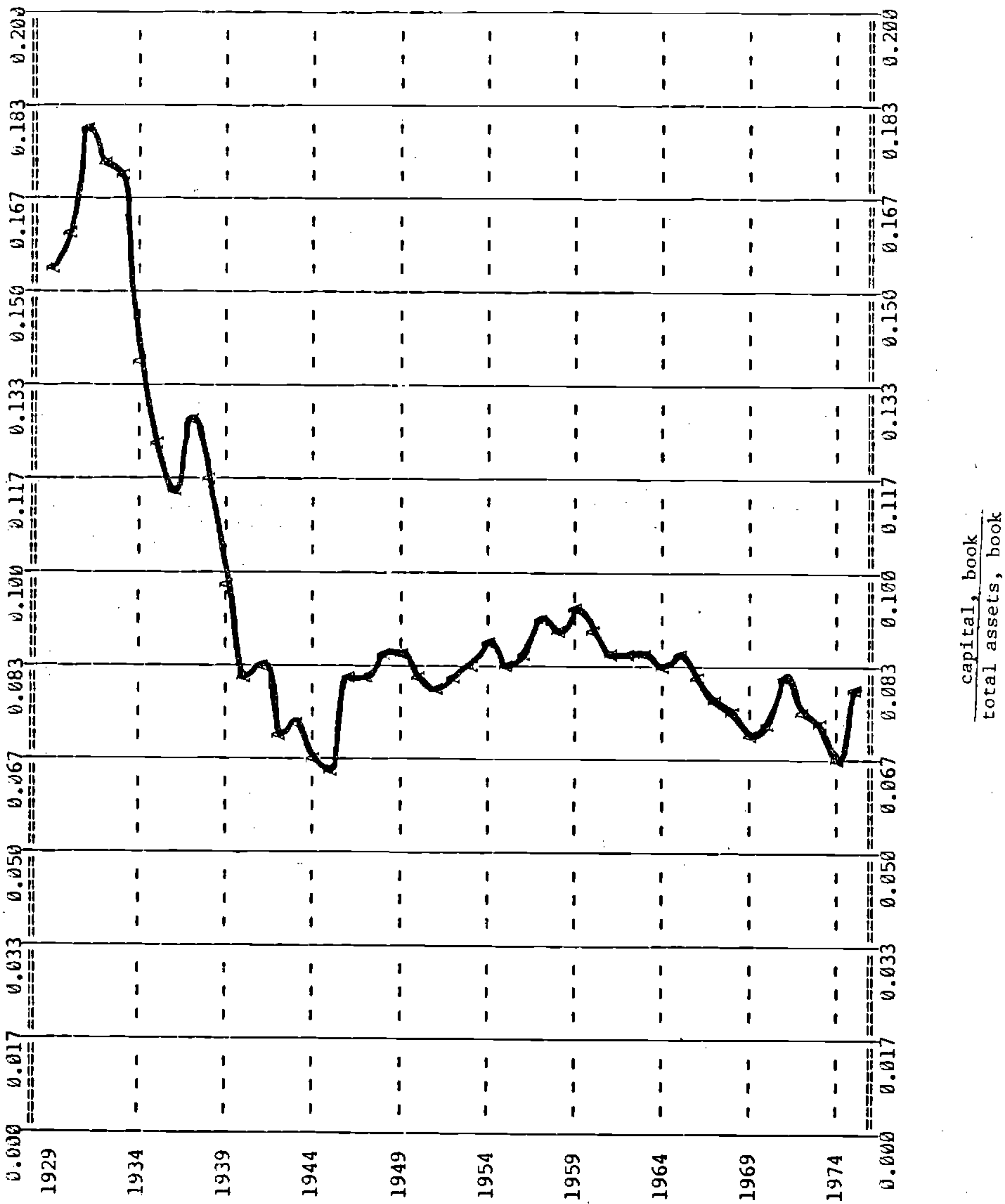

0.000
0.017
0.033
0.050
0.067
0.083
0.100
0.117
0.133
0.150
0.167
0.183
0.200
1929
1934
1939
1944
1949
1954
1959
1964
1969
1974
capital, book
total assets, book

FIGURE A-3.7

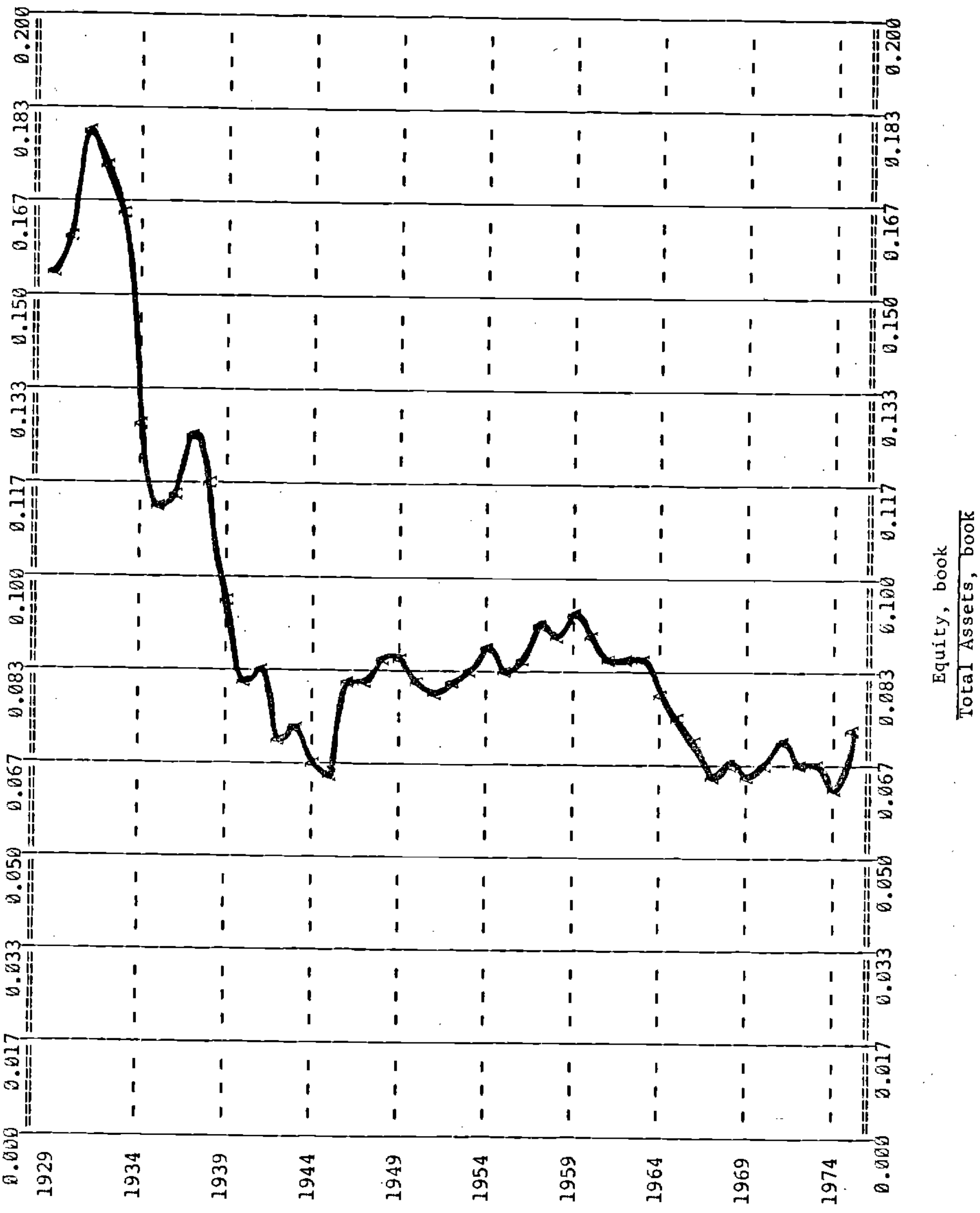
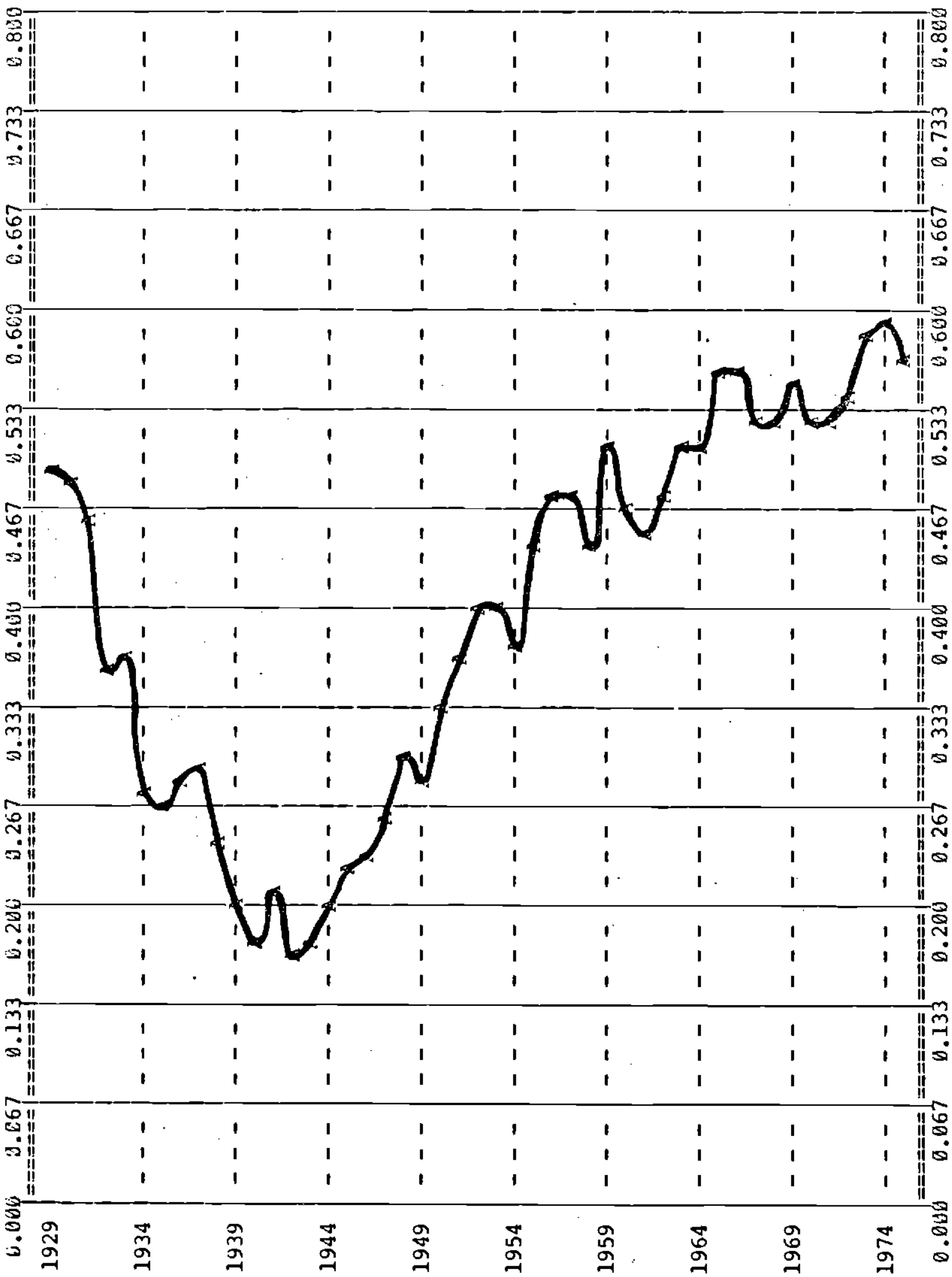
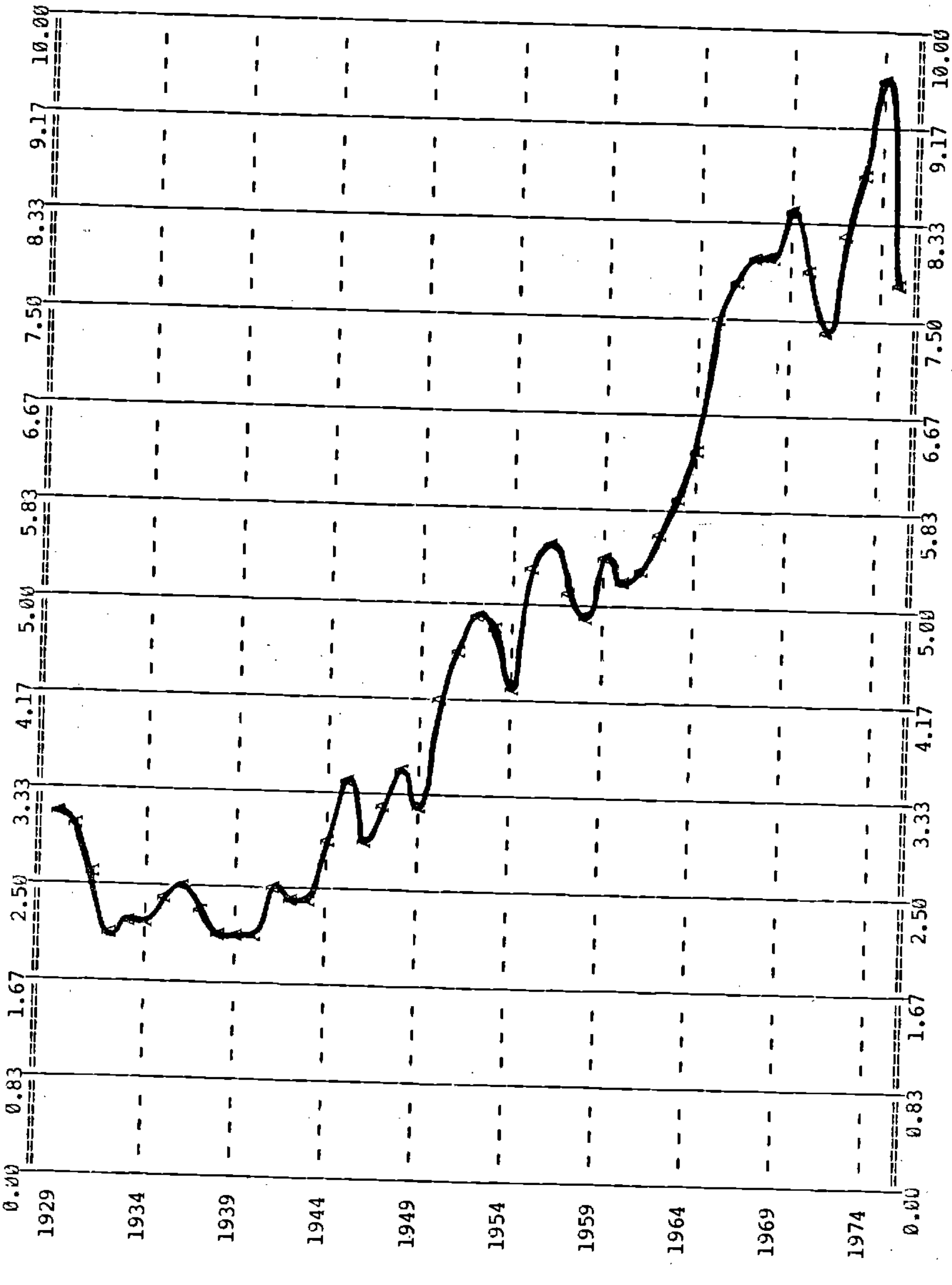

0.000
0.017
0.033
0.050
0.067
0.083
0.100
0.117
0.133
0.150
0.167
0.183
0.200
1929
1934
1939
1944
1949
1954
1959
1964
1969
1974
Equity, book
Total Assets, book

FIGURE A-3.8




loans, book value / total assets, book value New York City Banks

FIGURE A-3.9




$\frac{\text{loans at book value}}{\text{equity at book value}}$ New York City Banks

FIGURE A-3.10

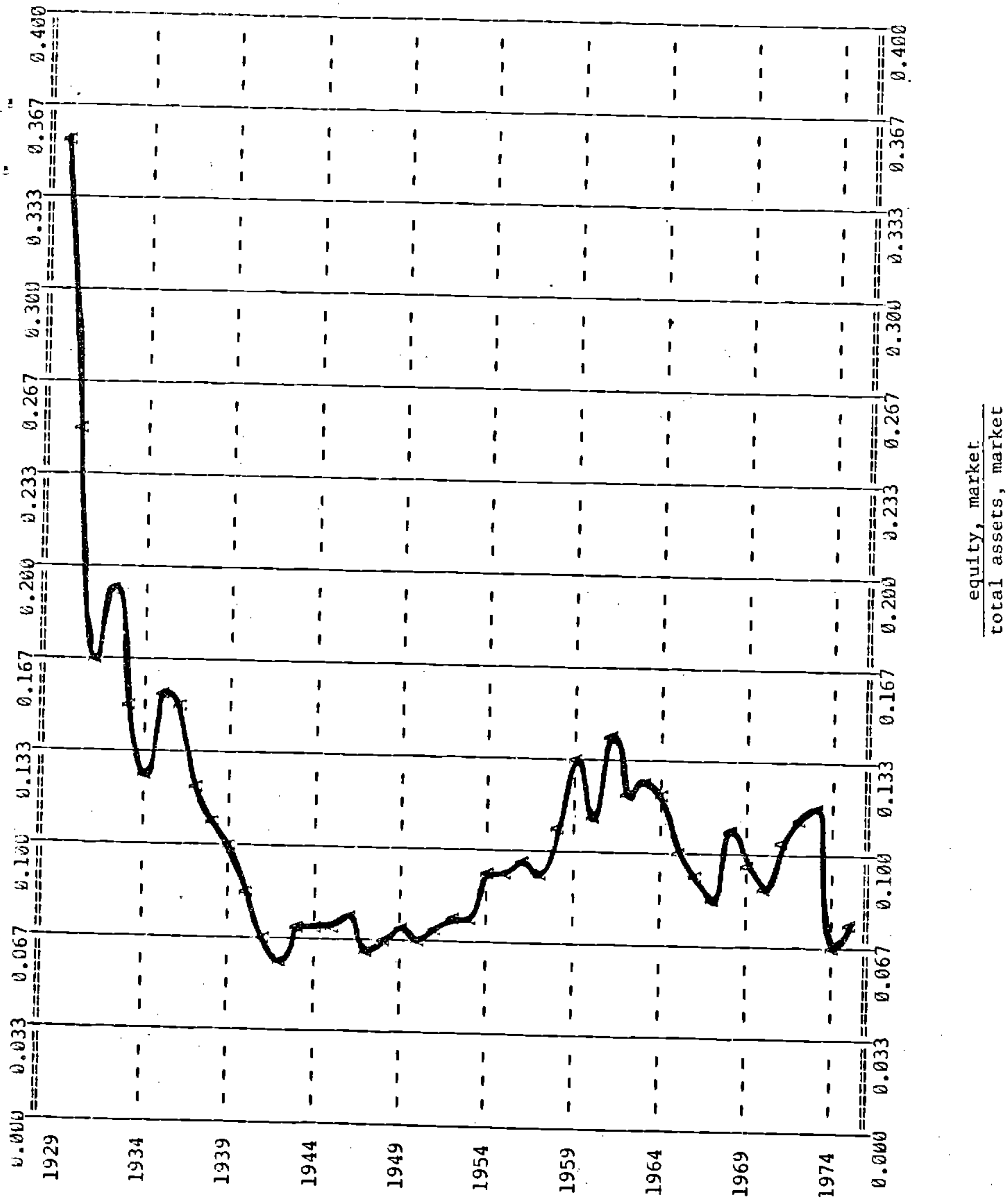
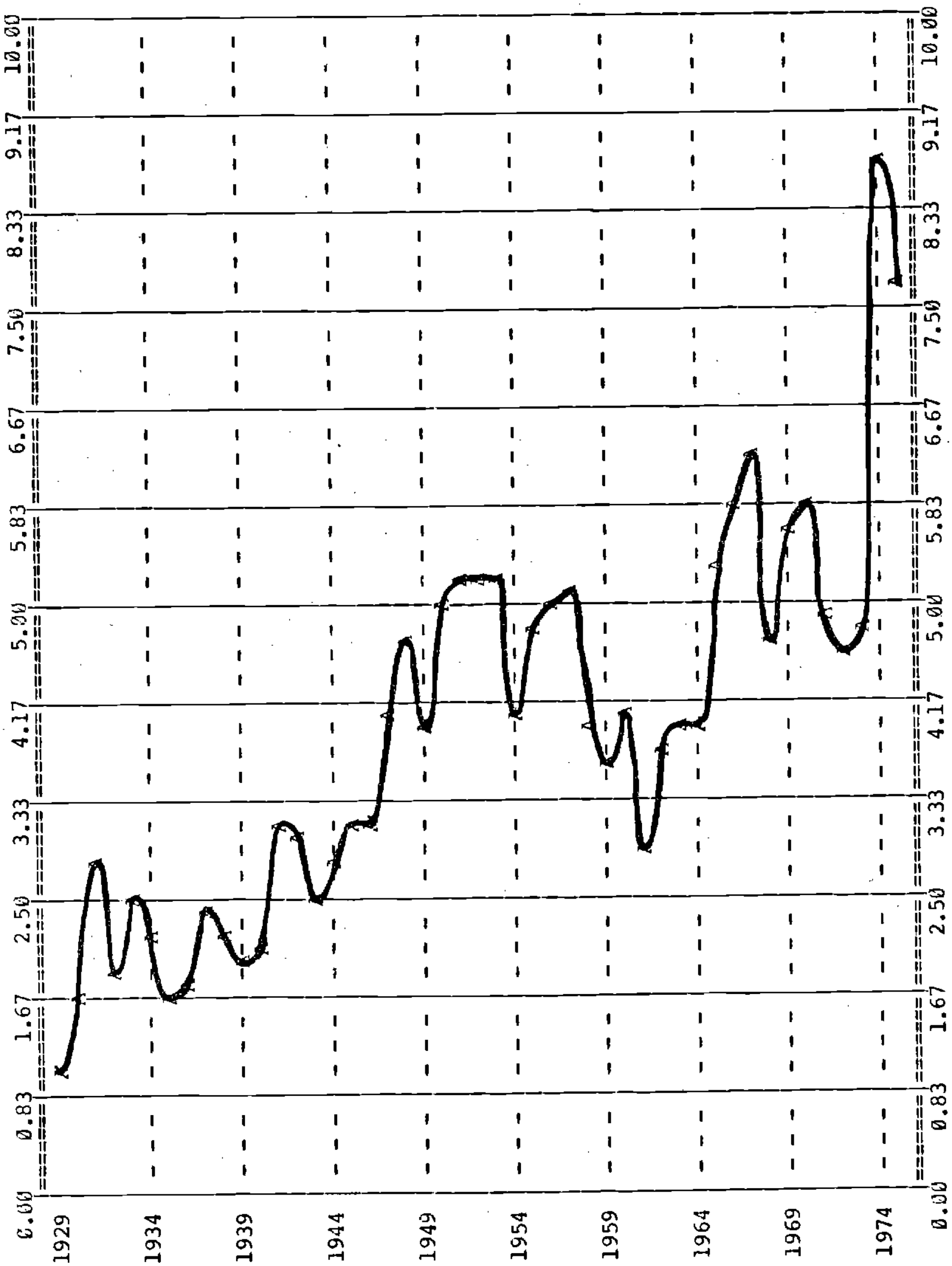

0.000
0.033
0.067
0.100
0.133
0.167
0.200
0.233
0.267
0.300
0.333
0.367
0.400
1929
1934
1939
1944
1949
1954
1959
1964
1969
1974
equity, market
total assets, market

FIGURE A-3.11




loans, market / equity, market

FIGURE A-3.12

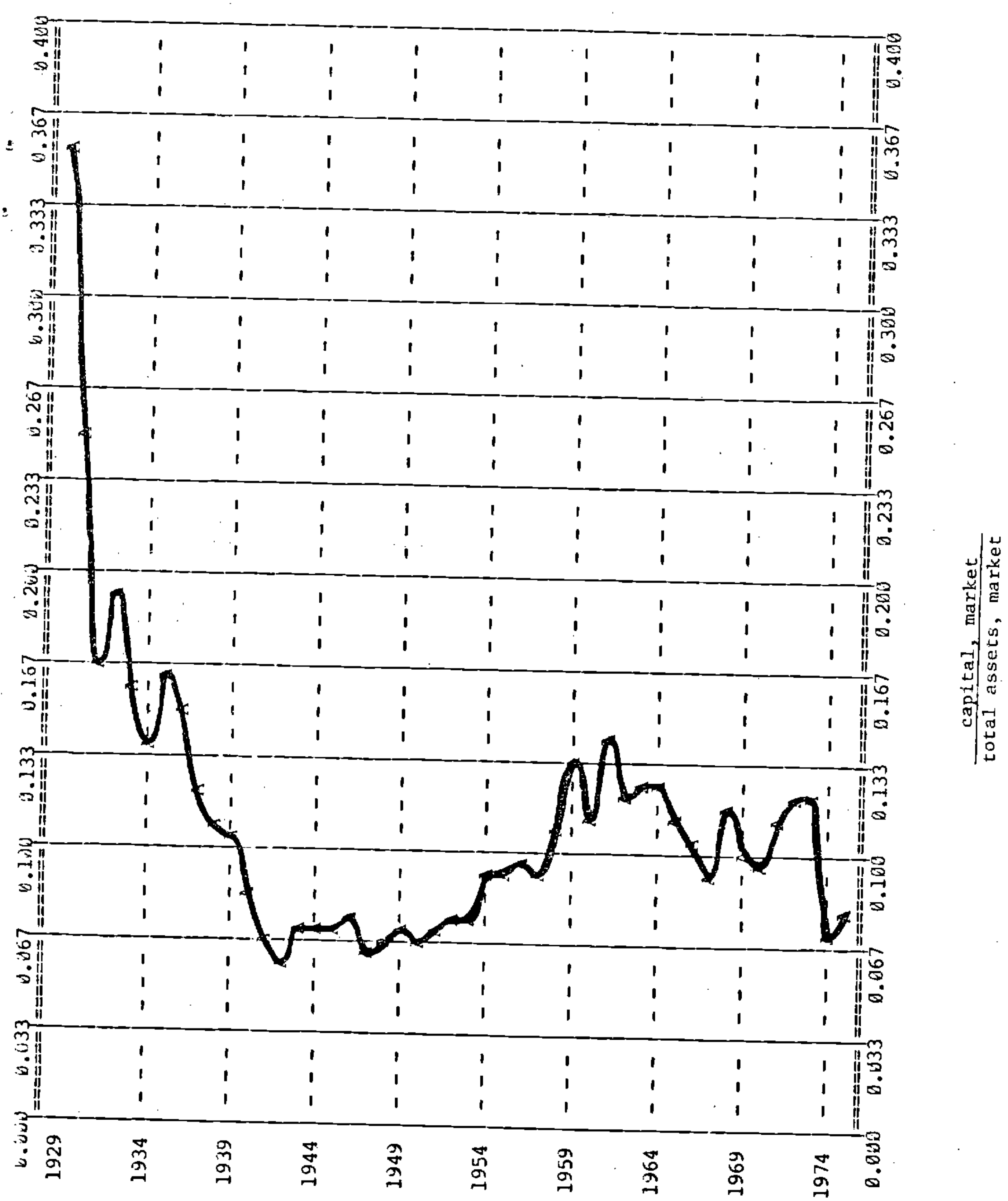

0.000
0.033
0.067
0.100
0.133
0.167
0.200
0.233
0.267
0.300
0.333
0.367
0.400
1929
1934
1939
1944
1949
1954
1959
1964
1969
1974
capital, market
total assets, market

FIGURE A-3.13

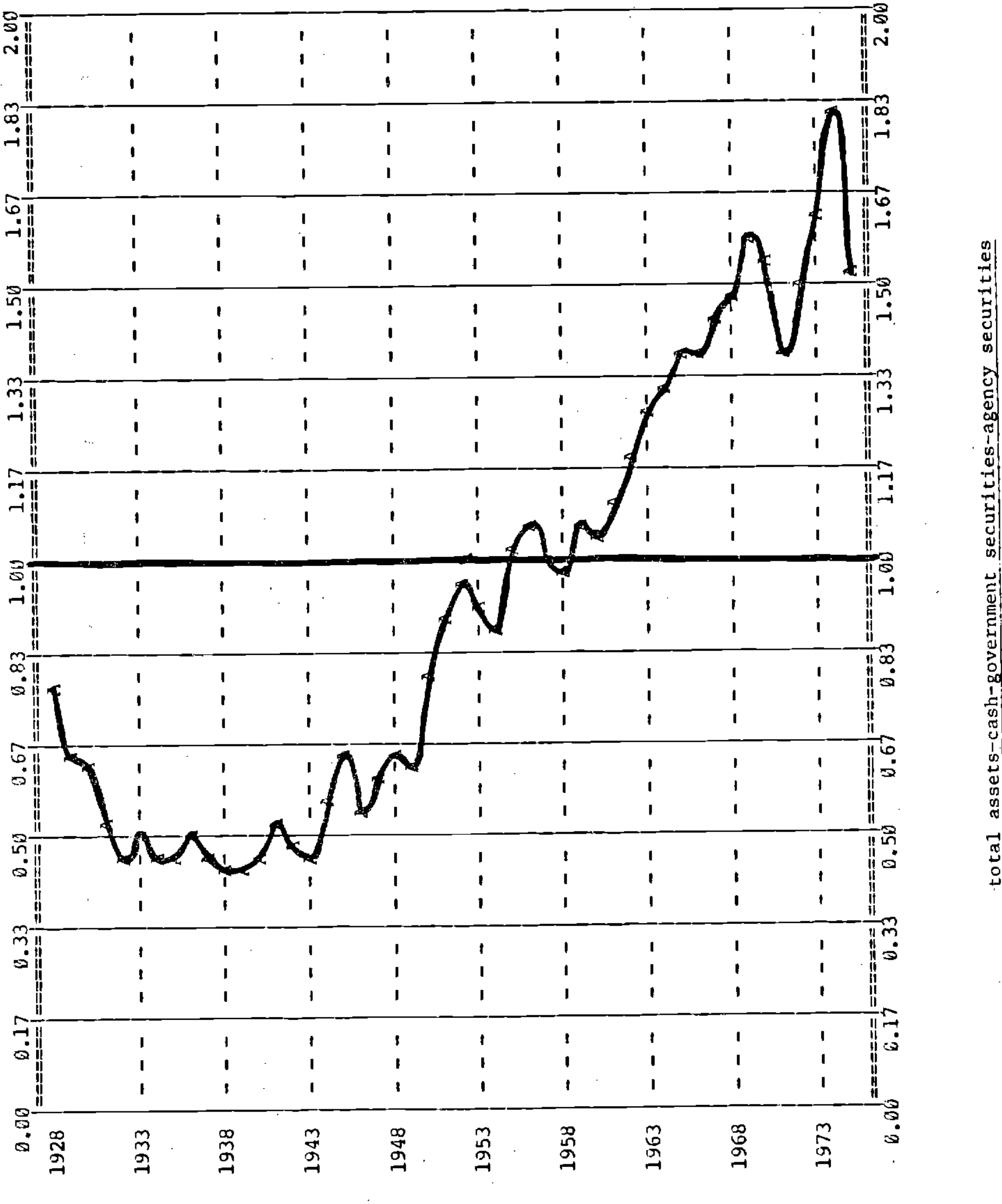
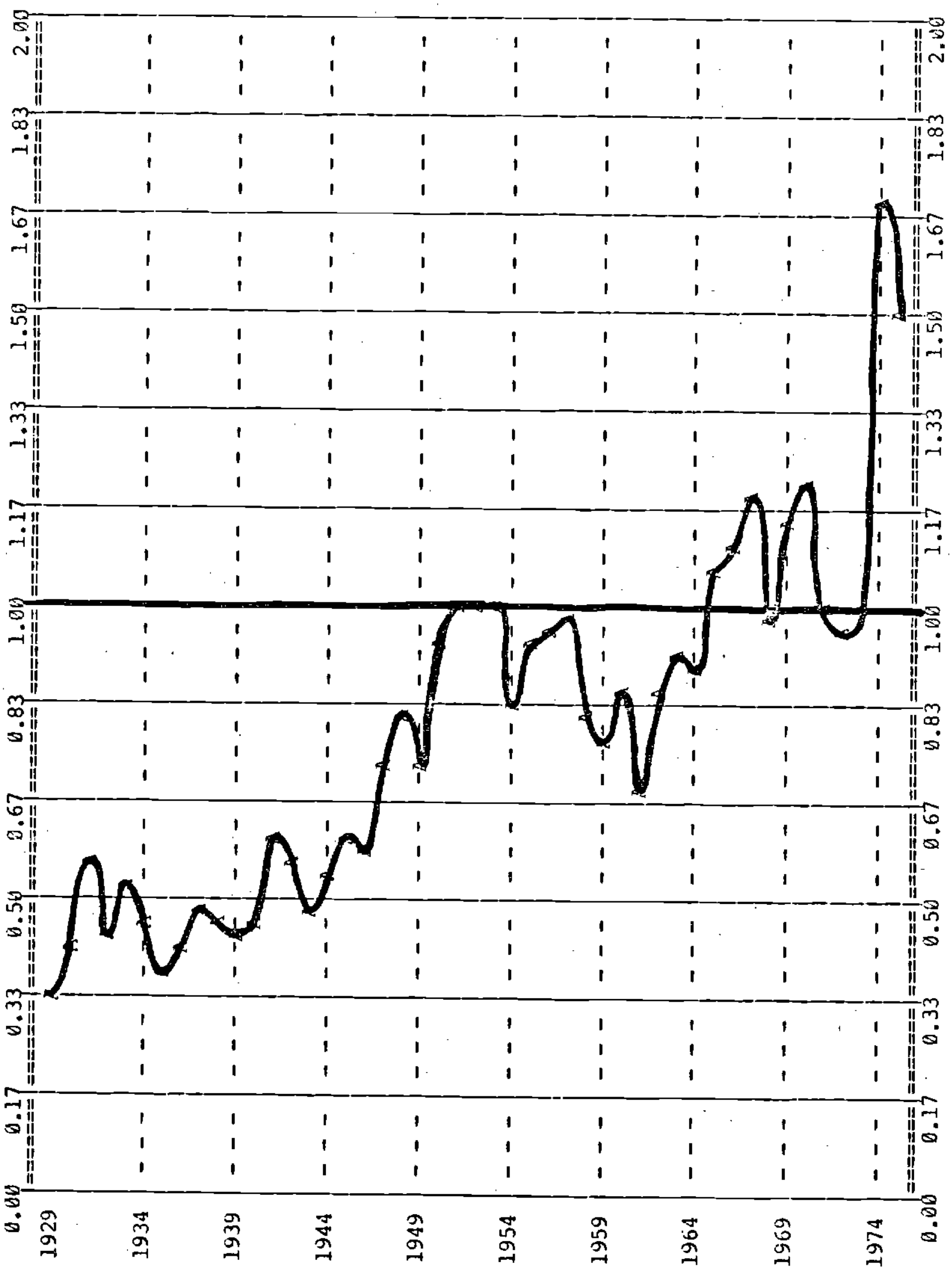

0.00
0.17
0.33
0.50
0.67
0.83
1.00
1.17
1.33
1.50
1.67
1.83
2.00
1928
1933
1938
1943
1948
1953
1958
1963
1968
1973
total assets-cash-government securities-agency securities
6·capital (book)

FIGURE A-3.14




total assets, market-cash-government securities-agency securities / 6·capital (market)

FIGURE A-3.15

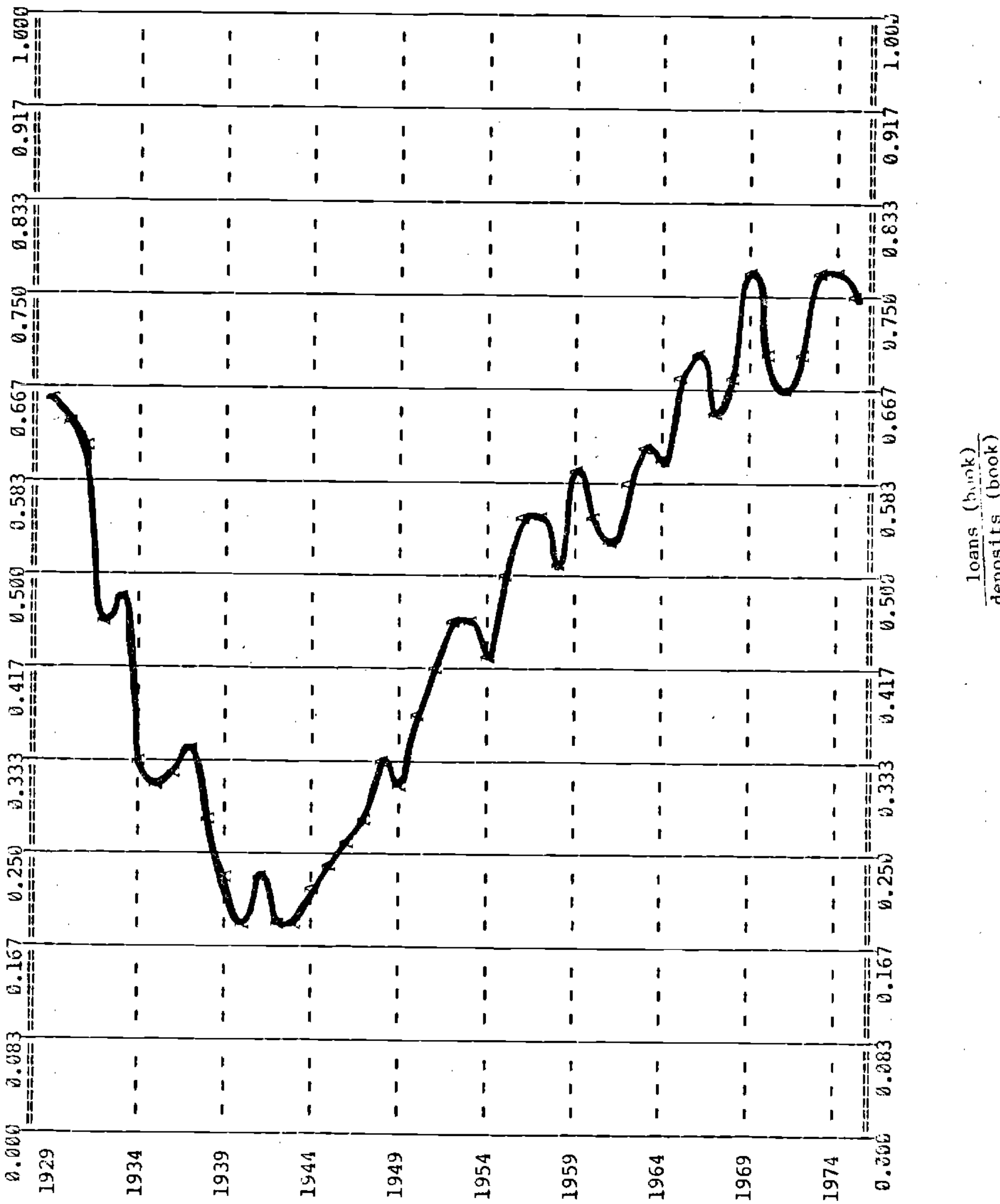
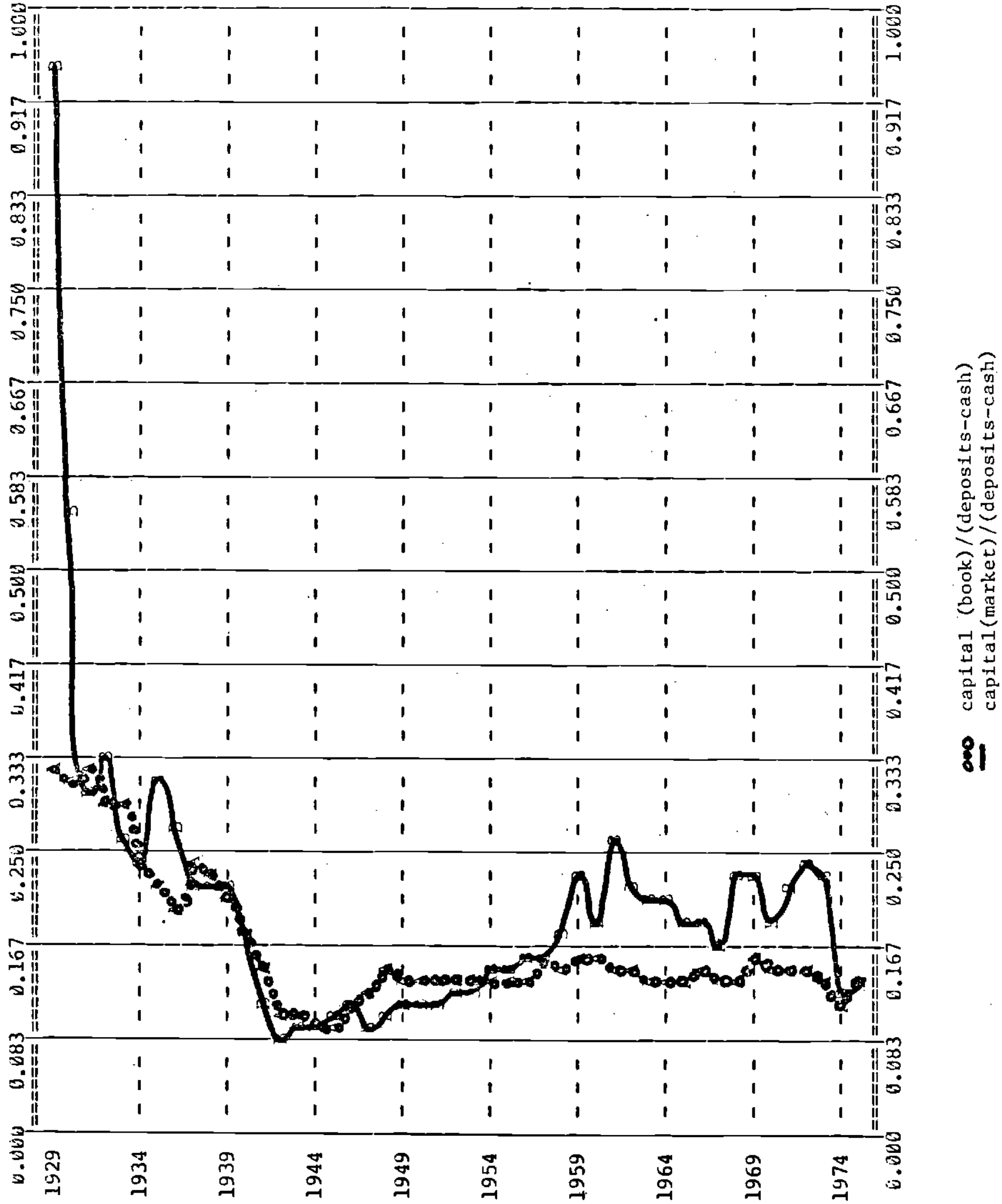
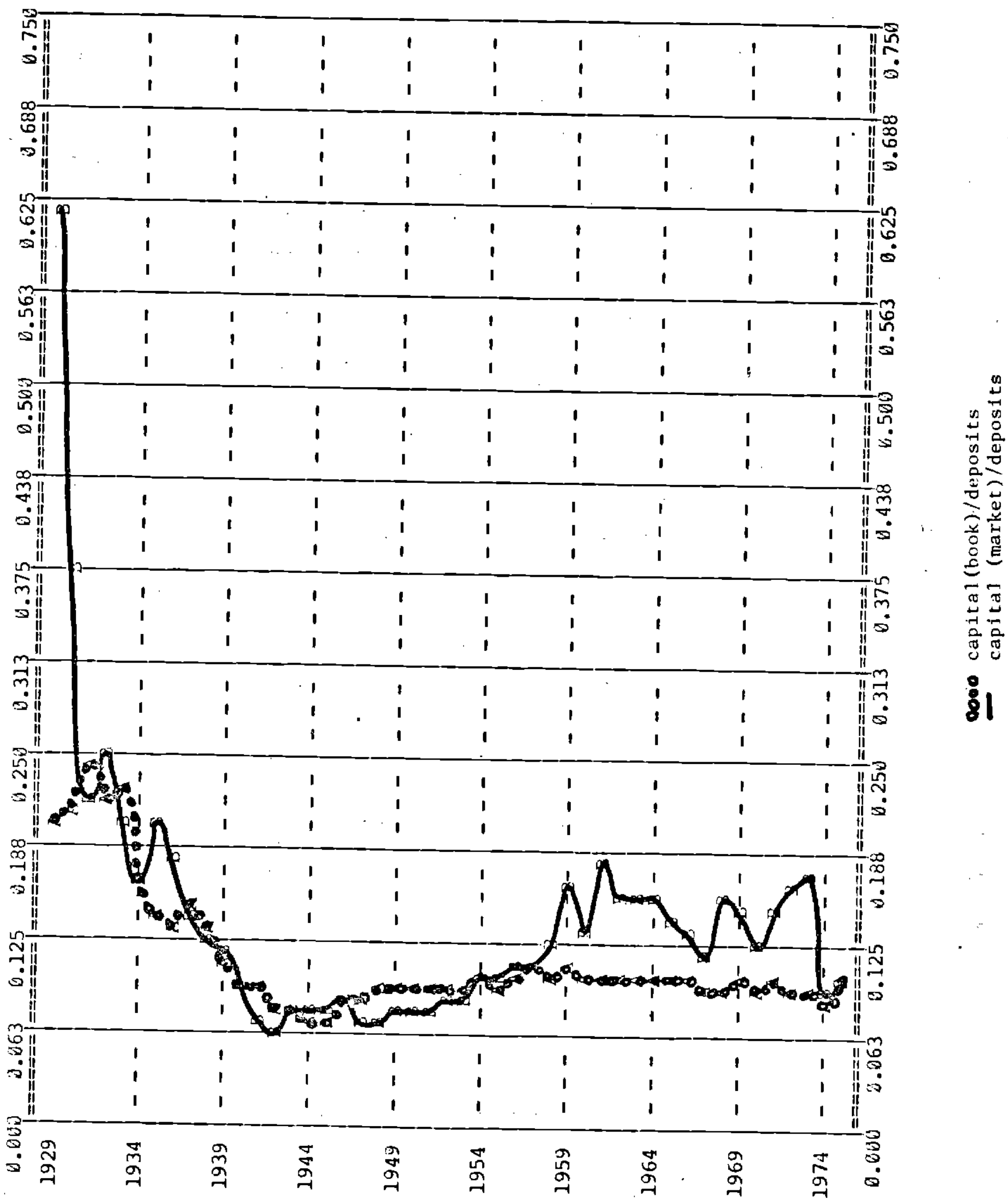

0.000
0.083
0.167
0.250
0.333
0.417
0.500
0.583
0.667
0.750
0.833
0.917
1.000
1929
1934
1939
1944
1949
1954
1959
1964
1969
1974
loans (bank)
deposits (book)

FIGURE A-3.16



0.000
0.083
0.167
0.250
0.333
0.417
0.500
0.583
0.667
0.750
0.833
0.917
1.000
1929
1934
1939
1944
1949
1954
1959
1964
1969
1974
capital (book)/(deposits-cash)
capital(market)/(deposits-cash)

FIGURE A-3.17


0.000
0.063
0.125
0.188
0.250
0.313
0.375
0.438
0.500
0.563
0.625
0.688
0.750
1929
1934
1939
1944
1949
1954
1959
1964
1969
1974
capital(book)/deposits
capital (market)/deposits

## SECTION A-4

### Historical Perspective on Interest Rates and the Return on the Market

This section provides some historical perspective on the movements of interest rates and market prices over time. To supply insights into the changing term structure, serial correlations and cross-correlations are also presented.

The analysis uses the relative change in Standard and Poor's composite index as the surrogate for the return on the market each month. Since dividends are not included, such changes represent only capital gains and losses, most of which are unanticipated. Index values for the last Wednesday of each month from January, 1929 to December, 1975 were used.

Total return on treasury bills, computed based on last-day-of-the-month values were obtained from Ibotson and Sinquefield.[5] Only data from 1938 to 1975 were used.

The remaining interest data were based on Standard and Poor's Bond indices. The four series utilized were: government short term yields (3 to 4 years), government intermediate yields (6 to 9 years), government long term yields (over 10 years) and medium grade corporate bond yields. The medium grade corporate bond index is composed on bonds rated B1+ (until the mid-1950's) and BBB thereafter. The data, computed as of the last Wednesday of the month are available from January, 1938 for all four series.[6]

---

[5]These data are described in greater detail in Ibotson, Roger G. and Rex A. Sinquefield, "Stocks, Bonds, Bills and Inflation: Year by Year Historical Returns (1926-1974)," Journal of Business, January 1976, pp. 11-47. We obtained the data from the authors.

[6]In the three government indices, the data we used for December, 1937 is actually the first Wednesday of January, 1938.

After 1942 the Standard and Poor's government intermediate and long term indices were based on fully taxable issues. For the period 1938-1941 the indices were based on tax-exempt series. Both figures were given for 1942. Our results are based on figures obtained by increasing the 1938-1941 tax-exempt yields for intermediate and long term bonds by amounts equal to the average difference between the tax-exempt and taxable series during the 12 overlapping months of 1942. The intermediate term tax-exempt yields were increased by 31 basis points and the long term tax-exempt yields by 27 basis points. During the overlapping period in 1942 there was only a .2 basis point difference between taxable and tax-exempt short term government yields so the original figures for 1938-1941 were used. The four series are graphed in Figure A-4.1 (only the last month in each quarter is shown).

From the yields to maturity we computed total returns and capital gains or losses. This was done as follows.

Let $y_0$ = yield to maturity at the beginning of the month

$y_1$ = yield to maturity at month-end

Both yields are annual yields divided by 12.

$P_0$ = price of the bond at the beginning of the month

$P_1$ = price of the bond at the end of the month

$m$ = months to maturity (from end of month 0)

$c$ = coupon per month

Assume we buy a par bond which sells for $P_0 = 1$ at the beginning of the month, and pays a coupon of $c$ per month where $c = y_0$. At month end the price of the bond is

$$P_1 = c^* \left[\frac{1}{y_1} - \frac{1}{y_1}\left(\frac{1}{(1+y_1)^m}\right)\right] + 1\cdot\left(\frac{1}{(1+y_1)^m}\right)$$

The first term is the present discounted value of the coupon stream of the bond and the second term is the present discounted value of the principal which will be repayed at the end of month m-1. Rearranging,

$$P_1 = \frac{y_0}{y_1} + \left(1 - \frac{y_0}{y_1}\right)\left(\frac{1}{(1+y_1)^m}\right)$$

So

$$\frac{P_1 - P_0}{P_0} = P_1 - 1 = \left(\frac{y_0}{y_1} - 1\right)\left(1 - \frac{1}{(1+y_1)^m}\right)$$

When computing price indices, Standard and Poor's assumes a $3\frac{1}{3}$ year maturity for the short term government bond index, a $7\frac{1}{2}$ year maturity for the intermediate term government bond index, a 15 year maturity for the long term government bond index, and a 20 year maturity for the medium grade corporate bond index. We adopted these assumptions. Monthly total returns were computed by adding the monthly yield to maturity to capital gains or losses.

Table A-4.1 indicates the variable names. Table A-4.2 shows the statistics for the bond series (yields, capital gains and total returns) and the return on the market. The table is in absolute amounts, that is, the mean return on the market was .43 percent per month, the mean yield to maturity on short term government bonds was .26 percent per month, the mean capital loss on these bonds was .03 percent per month and total returns on short term government bonds were .23 percent per month or 2.78 percent per year. Table A-4.3 shows the correlations among the variables. Table A-4.4[7] shows the results of regressions of the form:

Total Return = constant + capital gains (-1) and

[7] On following page.

capital gains = constant + capital gains (-1)

With the exception of the treasury bills, such regressions have limited explanatory power. Regressions with higher order distributed lags did not provide significantly higher explanatory power.

Various regressions of combinations of capital gains and market returns were performed to estimate cross correlations. Representative results were obtained as follows. Complete regressions were run of the forms:

$$CGGOVS = C + B1 \cdot PCSPI + B2 \cdot CGGOVI + B3 \cdot CGGOVL + B4 \cdot CGMEDC$$

$$CGGOVI = C + B1 \cdot PCSPI + B2 \cdot CGGOVS + B3 \cdot CGGOVL + B4 \cdot CGMEDC$$

$$CGGOVL = C + B1 \cdot PCSPI + B2 \cdot CGGOVS + B3 \cdot CGGOVI + B4 \cdot CGMEDC$$

$$CGMEDC = C + B1 \cdot PCSPI + B2 \cdot CGGOVS + B3 \cdot CGGOVI + B4 \cdot CGGOVL$$

$$PCSPI = C + B1 \cdot CGGOVS + B2 \cdot CGGOVI + B3 \cdot CGGOVL + B4 \cdot CGMEDC$$

Next, all variables with T-statistics less than 2 were eliminated and the regressions rerun. The results are shown in Table A-4.5.

---

[7]The abbreviations used in the regression output are:
NOB = Number of Observations
Range = Regression bounds
Novar = Number of Coefficients being estimated.
RSQ = R-squared statistic for the regression
CRSQ = Corrected R-squared statistic
F = F-test for R-squared statistic
SER = Standard Error of the Regression
SSR = Sum of Squared Residuals
DW = Durbin Watson Statistic
LHS Mean = Mean value of the left hand side of the equation
SR = Sum of the residuals
Coef = Name of coefficient
Value = Coefficient value calculated by the regression
Ster = Standard error of each coefficient
T-stat = T-statistic for each coefficient
Mean = Mean Value of the Coefficients Coterm
Partial = Partial correlation coefficient
Beta = Beta coefficients
Covariance Matrix = Covariance matrix of errors in the coefficients

TABLE A-4.1

Variable Names

| | | |
|---|---|---|
| pcspi | - | return on the market $\frac{P_1-P_0}{P_0}$ |
| ymtgovs | - | monthly yield to maturity, government short term bonds |
| cggovs | - | capital gains, government short term bonds |
| retgovs | - | total returns, government short term bonds |
| ymtgovi | - | monthly yield to maturity, government intermediate term bonds |
| cggovi | - | capital gains, government intermediate term bonds |
| retgovi | - | total returns, government intermediate term bonds |
| ymtgovl | - | monthly yield to maturity, government long term bonds |
| cggovl | - | capital gains, government long term bonds |
| retgovl | - | total returns, government long term bonds |
| ymtmedc | - | yield to maturity, medium grade corporate bonds |
| cgmedc | - | capital gains, medium grade corporate bonds |
| retmedc | - | total returns, medium grade corporate bonds |
| rettb | - | total returns, treasury bills |

TABLE A-4.2

| | NOB | MIN | MEAN | MAX | STD. DEVIATION |
|---|---|---|---|---|---|
| PCSPI | 575 | -0.301383 | 0.004338 | 0.450472 | 0.059876 |
| YMTGOVS | 457 | 0.000225 | 0.002647 | 0.00725 | 0.001809 |
| CGGOVS | 456 | -0.025775 | -0.000388 | 0.036084 | 0.006853 |
| RETGOVS | 456 | -0.021812 | 0.002263 | 0.040776 | 0.006962 |
| YMTGOVI | 457 | 0.001042 | 0.002983 | 0.006983 | 0.00158 |
| CGGOVI | 456 | -0.05525 | -0.000616 | 0.062676 | 0.012074 |
| RETGOVI | 456 | -0.053141 | 0.002369 | 0.067676 | 0.012048 |
| YMTGOVL | 457 | 0.001683 | 0.003077 | 0.0062 | 0.001221 |
| CGGOVL | 456 | -0.067934 | -0.00069 | 0.059244 | 0.01402 |
| RETGOVL | 456 | -0.065501 | 0.002388 | 0.06446 | 0.013992 |
| YMTMEDC | 457 | 0.002385 | 0.004325 | 0.008592 | 0.001664 |
| CGMEDC | 456 | -0.070384 | -0.000965 | 0.06907 | 0.012984 |
| RETMEDC | 456 | -0.065233 | 0.003359 | 0.076084 | 0.012879 |
| RETTB | 456 | -0.0002 | 0.002072 | 0.008 | 0.001827 |

TABLE A-4.3

RANGE 1938 1 1975 12 CORRELATION MATRIX

| | PCSPI | CGGOVS | CGGOVI | CGGOVL | CGMEDC |
|---|---|---|---|---|---|
| PCSPI | 1.000 | | | | |
| CGGOVS | 0.094 | 1.000 | | | |
| CGGOVI | 0.113 | 0.812 | 1.000 | | |
| CGGOVL | 0.132 | 0.686 | 0.741 | 1.000 | |
| CGMEDC | 0.432 | 0.399 | 0.438 | 0.458 | 1.000 |

RANGE 1938 1 1975 12 CORRELATION MATRIX

| | PCSPI | RETGOVS | RETGOVI | RETGOVL | RETMEDC | RETTB |
|---|---|---|---|---|---|---|
| PCSPI | 1.000 | | | | | |
| RETGOVS | 0.070 | 1.000 | | | | |
| RETGOVI | 0.101 | 0.807 | 1.000 | | | |
| RETGOVL | 0.125 | 0.677 | 0.742 | 1.000 | | |
| RETMEDC | 0.426 | 0.367 | 0.431 | 0.458 | 1.000 | |
| RETTB | -0.096 | 0.255 | 0.097 | 0.049 | -0.112 | 1.000 |

RANGE 1937 12 1975 12 CORRELATION MATRIX

| | PCSPI | YMTGOVS | YMTGOVI | YMTGOVL | YMTMEDC |
|---|---|---|---|---|---|
| PCSPI | 1.000 | | | | |
| YMTGOVS | -0.089 | 1.000 | | | |
| YMTGOVI | -0.088 | 0.988 | 1.000 | | |
| YMTGOVL | -0.084 | 0.973 | 0.990 | 1.000 | |
| YMTMEDC | -0.075 | 0.886 | 0.930 | 0.935 | 1.000 |

TABLE A-4.4

10: RETTB = A+B*RETTB(-1)

NOB = 455 NOVAR = 2
RANGE = 1938 2 TO 1975 12
RSQ = 0.93791 CRSQ = 0.93777 F(1/453) = 6842.860
SER = 4.56E-04 SSR = 9.406E-05 DW(0) = 2.77
LHS MEAN = 0.00208 SR = -0.

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| A | 7.37877E-05 | 3.22911E-05 | 2.28508 | 1.00000 |
| B | 0.96929 | 0.01172 | 82.72150 | 0.00207 |

| COEF | PARTIAL | BETA |
|---|---|---|
| A | 0.10675 | 0.00000 |
| B | 0.96846 | 0.96846 |

COVARIANCE MATRIX

| | | |
|---|---|---|
| A | 1.043E-09 | |
| B | -2.837E-07 | 1.373E-04 |

1: RETGOVS = A+B*RETGOVS(-1)

NOB = 455 NOVAR = 2
RANGE = 1938 2 TO 1975 12
RSQ = 0.02943 CRSQ = 0.02729 F(1/453) = 13.736
SER = 6.87E-03 SSR = 2.140E-02 DW(0) = 2.00
LHS MEAN = 0.00226 SR = -0.

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| A | 0.00188 | 3.38524E-04 | 5.54020 | 1.00000 |
| B | 0.17262 | 0.04658 | 3.70618 | 0.00223 |

| COEF | PARTIAL | BETA |
|---|---|---|
| A | 0.25191 | 0.00000 |
| B | 0.17155 | 0.17155 |

COVARIANCE MATRIX

| | | |
|---|---|---|
| A | 1.146E-07 | |
| B | -4.831E-06 | 2.169E-03 |

2: RETGOVI = A+B*RETGOVI(-1)

NOB = 455 NOVAR = 2
RANGE = 1938 2 TO 1975 12
RSQ = 9.25E-04 CRSQ = -0.00128 F(1/453) = 0.419
SER = 0.0121 SSR = 6.594E-02 DW(0) = 1.99
LHS MEAN = 0.00235 SR = -0.

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| A | 0.00228 | 5.76155E-04 | 3.96123 | 1.00000 |
| B | 0.03046 | 0.04704 | 0.64751 | 0.00233 |

| COEF | PARTIAL | BETA |
|---|---|---|
| A | 0.18297 | 0.00000 |
| B | 0.03041 | 0.03041 |

COVARIANCE MATRIX

| | | |
|---|---|---|
| A | 3.320E-07 | |
| B | -5.162E-06 | 2.213E-03 |

TABLE A-4.4
(continued)

3: RETGOVL = A+B*RETGOVL(-1)

```
NOB = 455        NOVAR = 2
RANGE =  1938  2 TO 1975 12
RSQ =   1.07E-05        CRSQ =   -0.0022        F(1/453) =  4.85E-03
SER =   0.0140          SSR = 8.907E-02         DW(0) =  2.00
LHS MEAN =        0.00238        SR =         -0.
```

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| A | 0.00239 | 6.66660E-04 | 3.58205 | 1.00000 |
| B | -0.00329 | 0.04703 | -0.06998 | 0.00236 |

| COEF | PARTIAL | BETA |
|---|---|---|
| A | 0.16597 | 0.00000 |
| B | -0.00329 | -0.00329 |

COVARIANCE MATRIX

| | | |
|---|---|---|
| A | 4.444E-07 | |
| B | -5.217E-06 | 2.212E-03 |

4: RETMEDC = A+B*RETMEDC(-1)

```
NOB = 455        NOVAR = 2
RANGE =  1938  2 TO 1975 12
RSQ =    0.00796        CRSQ =    0.00577        F(1/453) =      3.634
SER =    0.0128         SSR = 7.473E-02          DW(0) =   2.00
LHS MEAN =        0.00339        SR =         -0.
```

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| A | 0.00309 | 6.21945E-04 | 4.96651 | 1.00000 |
| B | 0.08926 | 0.04683 | 1.90623 | 0.00333 |

| COEF | PARTIAL | BETA |
|---|---|---|
| A | 0.22724 | 0.00000 |
| B | 0.08921 | 0.08921 |

COVARIANCE MATRIX

| | | |
|---|---|---|
| A | 3.868E-07 | |
| B | -7.292E-06 | 2.193E-03 |

5: CGGOVS = A+B*CGGOVS(-1)

```
NOB = 455        NOVAR = 2
RANGE =  1938  2 TO 1975 12
RSQ =    0.01512        CRSQ =    0.01295        F(1/453) =      6.956
SER = 6.81E-03          SSR = 2.104E-02          DW(0) =   1.99
LHS MEAN = -3.95139E-04        SR =         0.
```

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| A | -3.43609E-04 | 3.20073E-04 | -1.07353 | 1.00000 |
| B | 0.12347 | 0.04681 | 2.63739 | -4.17367E-04 |

| COEF | PARTIAL | BETA |
|---|---|---|
| A | -0.05037 | 0.00000 |
| B | 0.12297 | 0.12297 |

COVARIANCE MATRIX

| | | |
|---|---|---|
| A | 1.024E-07 | |
| B | 9.147E-07 | 2.192E-03 |

TABLE A-4.4
(continued)

6: CGGOVI = A+B*CGGOVI(-1)

NOB = 455 NOVAR = 2
RANGE = 1938 2 TO 1975 12
RSQ = 4.98E-04 CRSQ = -0.00171 F(1/453) = 0.226
SER = 0.0121 SSR = 6.624E-02 DW(0) = 1.99
LHS MEAN = -6.34130E-04 SR = 0.

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| A | -6.19710E-04 | 5.67691E-04 | -1.09163 | 1.00000 |
| B | 0.02234 | 0.04701 | 0.47524 | -6.45472E-04 |

| COEF | PARTIAL | BETA |
|---|---|---|
| A | -0.05122 | 0.00000 |
| B | 0.02232 | 0.02232 |

COVARIANCE MATRIX

| | | |
|---|---|---|
| A | 3.223E-07 | |
| B | 1.427E-06 | 2.210E-03 |

7: CGGOVL = A+B*CGGOVL(-1)

NOB = 455 NOVAR = 2
RANGE = 1938 2 TO 1975 12
RSQ = 4.74E-05 CRSQ = -0.00216 F(1/453) = 2.14E-02
SER = 0.0140 SSR = 8.942E-02 DW(0) = 2.00
LHS MEAN = -6.99515E-04 SR = 0.

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| A | -7.04456E-04 | 6.59505E-04 | -1.06816 | 1.00000 |
| B | -0.00691 | 0.04701 | -0.14688 | -7.15361E-04 |

| COEF | PARTIAL | BETA |
|---|---|---|
| A | -0.05012 | 0.00000 |
| B | -0.00690 | -0.00690 |

COVARIANCE MATRIX

| | | |
|---|---|---|
| A | 4.349E-07 | |
| B | 1.581E-06 | 2.210E-03 |

8: CGMEDC = A+B*CGMEDC(-1)

NOB = 455 NOVAR = 2
RANGE = 1938 2 TO 1975 12
RSQ = 0.00959 CRSQ = 0.00741 F(1/453) = 4.389
SER = 0.0129 SSR = 7.582E-02 DW(0) = 2.00
LHS MEAN = -9.37504E-04 SR = 0.

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| A | -8.40610E-04 | 6.08260E-04 | -1.38199 | 1.00000 |
| B | 0.09793 | 0.04675 | 2.09487 | -9.89400E-04 |

| COEF | PARTIAL | BETA |
|---|---|---|
| A | -0.06480 | 0.00000 |
| B | 0.09795 | 0.09795 |

COVARIANCE MATRIX

| | | |
|---|---|---|
| A | 3.700E-07 | |
| B | 2.162E-06 | 2.186E-03 |

TABLE A-4.5

56: CGGOVL = C+B1*CGGOVS+B2*CGGOVI+B3*CGMEDC

NOB = 456 NOVAR = 4
RANGE = 1938 1 TO 1975 12
RSQ = 0.58881 CRSQ = 0.58608 F(3/452) = 215.750
SER = 9.02E-03 SSR = 3.678E-02 DW(0) = 2.38
LHS MEAN = -6.89957E-04 SR = -0.

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| C | -2.52418E-07 | 4.23760E-04 | -5.95662E-04 | 1.00000 |
| B1 | 0.46496 | 0.10618 | 4.37897 | -3.87816E-04 |
| B2 | 0.56867 | 0.06148 | 9.24986 | -6.16155E-04 |
| B3 | 0.16481 | 0.03635 | 4.53367 | -9.64770E-04 |

| COEF | PARTIAL | BETA |
|---|---|---|
| C | -2.80176E-05 | 0.00000 |
| B1 | 0.20173 | 0.22728 |
| B2 | 0.39895 | 0.48974 |
| B3 | 0.20856 | 0.15262 |

COVARIANCE MATRIX

| | | | | |
|---|---|---|---|---|
| C | 1.796E-07 | | | |
| B1 | 9.555E-07 | 1.127E-02 | | |
| B2 | -8.928E-08 | -5.050E-03 | 3.780E-03 | |
| B3 | 8.586E-07 | -3.165E-04 | -4.765E-04 | 1.321E-03 |

69: CGMEDC = C+B1*PCSPI+B2*CGGOVI+B3*CGGOVL

NOB = 456 NOVAR = 4
RANGE = 1938 1 TO 1975 12
RSQ = 0.36935 CRSQ = 0.36517 F(3/452) = 88.241
SER = 0.0103 SSR = 4.837E-02 DW(0) = 1.92
LHS MEAN = -9.64770E-04 SR = -0.

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| C | -0.00130 | 4.89796E-04 | -2.65380 | 1.00000 |
| B1 | 0.10818 | 0.01087 | 9.95105 | 0.00587 |
| B2 | 0.22200 | 0.05986 | 3.70886 | -6.16155E-04 |
| B3 | 0.23652 | 0.05167 | 4.57757 | -6.89957E-04 |

| COEF | PARTIAL | BETA |
|---|---|---|
| C | -0.12386 | 0.00000 |
| B1 | 0.42392 | 0.37506 |
| B2 | 0.17185 | 0.20644 |
| B3 | 0.21049 | 0.25540 |

COVARIANCE MATRIX

| | | | | |
|---|---|---|---|---|
| C | 2.399E-07 | | | |
| B1 | -7.308E-07 | 1.182E-04 | | |
| B2 | 7.207E-07 | -1.479E-05 | 3.583E-03 | |
| B3 | 6.744E-07 | -4.050E-05 | -2.281E-03 | 2.670E-03 |

TABLE A-4.5
(continued)

22: CGGOVS = C+B1*CGGOVI+B2*CGGOVL

NOB = 456 NOVAR = 3
RANGE = 1938 1 TO 1975 12
RSQ = 0.67562 CRSQ = 0.67419 F(2/453) = 471.763
SER = 3.91E-03 SSR = 6.932E-03 DW(0) = 2.12
LHS MEAN = -3.87816E-04 SR = -0.

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| C | -8.91701E-05 | 1.83458E-04 | -0.48605 | 1.00000 |
| B1 | 0.38285 | 0.02263 | 16.91950 | -6.16155E-04 |
| B2 | 0.09095 | 0.01949 | 4.66707 | -6.89957E-04 |

| COEF | PARTIAL | BETA |
|---|---|---|
| C | -0.02283 | 0.00000 |
| B1 | 0.62228 | 0.67451 |
| B2 | 0.21419 | 0.18606 |

COVARIANCE MATRIX

| | | | |
|---|---|---|---|
| C | 3.366E-08 | | |
| B1 | 8.997E-08 | 5.120E-04 | |
| B2 | 6.062E-08 | -3.269E-04 | 3.798E-04 |

42: CGGOVI = C+B1*CGGOVS+B2*CGGOVL+B3*CGMEDC

NOB = 456 NOVAR = 4
RANGE = 1938 1 TO 1975 12
RSQ = 0.72713 CRSQ = 0.72532 F(3/452) = 401.495
SER = 6.33E-03 SSR = 1.810E-02 DW(0) = 2.62
LHS MEAN = -6.16155E-04 SR = -0.

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| C | 1.99334E-05 | 2.97291E-04 | 0.06705 | 1.00000 |
| B1 | 0.99328 | 0.06001 | 16.55090 | -3.87816E-04 |
| B2 | 0.27989 | 0.03026 | 9.24986 | -6.89957E-04 |
| B3 | 0.05988 | 0.02592 | 2.30974 | -9.64770E-04 |

| COEF | PARTIAL | BETA |
|---|---|---|
| C | 0.00315 | 0.00000 |
| B1 | 0.61429 | 0.56378 |
| B2 | 0.39895 | 0.32499 |
| B3 | 0.10801 | 0.06439 |

COVARIANCE MATRIX

| | | | | |
|---|---|---|---|---|
| C | 8.838E-08 | | | |
| B1 | 4.264E-07 | 3.602E-03 | | |
| B2 | -1.207E-08 | -1.121E-03 | 9.156E-04 | |
| B3 | 4.199E-07 | -2.039E-04 | -2.165E-04 | 6.720E-04 |

TABLE A-4.5
(continued)

4: PCSPI = C+B1*CGMEDC

NOB = 456 NOVAR = 2
RANGE = 1938 1 TO 1975 12
RSQ = 0.18658 CRSQ = 0.18478 F(1/454) = 104.134
SER = 0.0406 SSR = 0.750 DW(0) = 2.05
LHS MEAN = 0.00587 SR = 0.

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| C | 0.00731 | 0.00191 | 3.83256 | 1.00000 |
| B1 | 1.49748 | 0.14675 | 10.20460 | -9.64770E-04 |

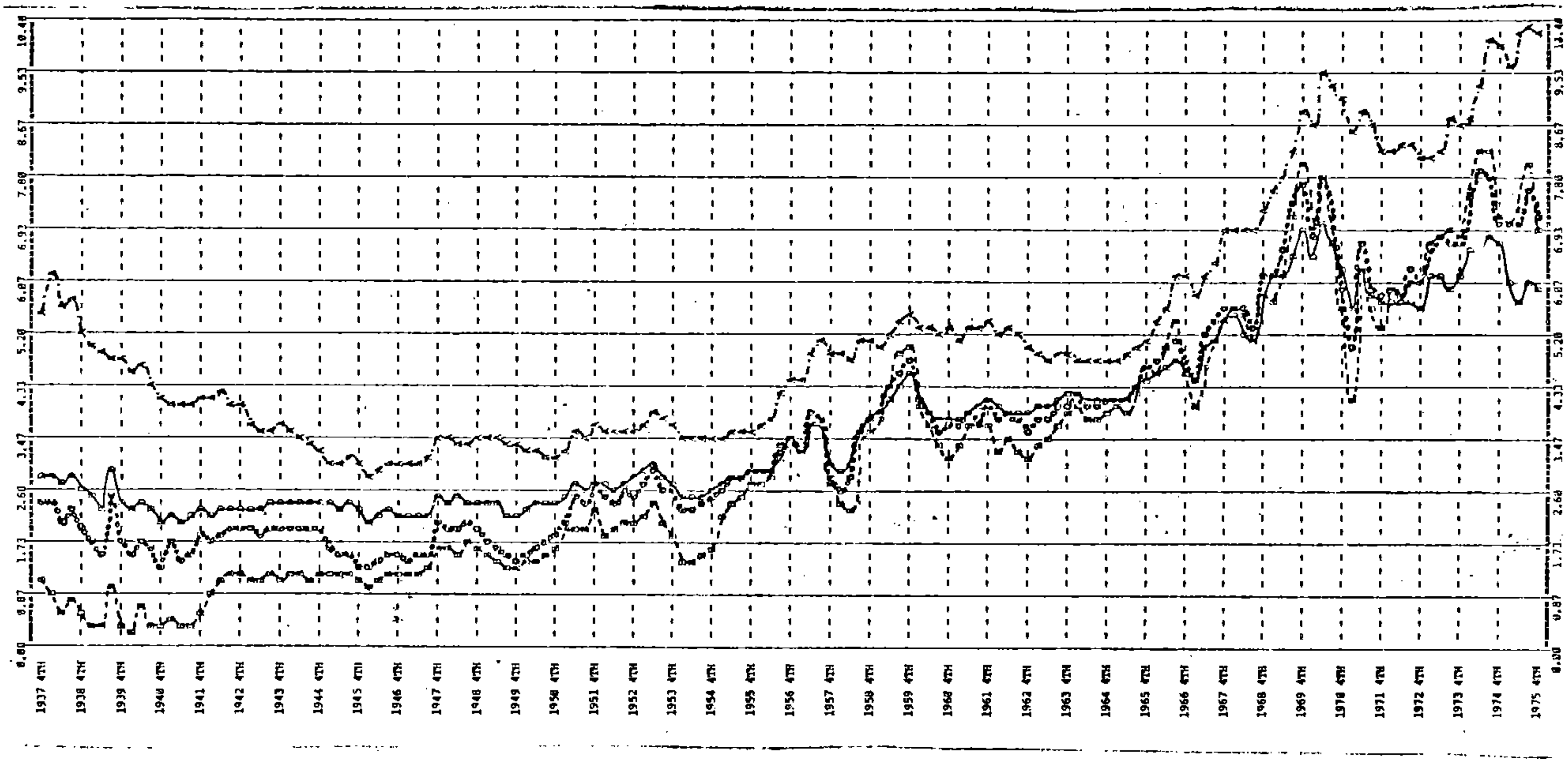
| COEF | PARTIAL | BETA |
|---|---|---|
| C | 0.17703 | 0.00000 |
| B1 | 0.43194 | 0.43194 |

COVARIANCE MATRIX

| | | |
|---|---|---|
| C | 3.642E-06 | |
| B1 | 2.078E-05 | 2.153E-02 |

FIGURE A-4.1

Yield to Maturity (Annual Percents)




— · — · — medium grade corporate bonds

oooooo intermediate term government bonds

– – – – short term government bonds

———— long term government bonds

Legend is top to bottom in order of finish

# SECTION B-1

## Responses of Equity to Single Macroeconomic Variables

An attempt was made to find the sensitivities of various elements in the bank's portfolio to single macroeconomic variables. Our success was limited at best.

The bank balance sheet data used were computed from the Federal Reserve Board's data on Reserve City Member Banks in New York City as described in Section A-2. The interest rate data are from the Standard and Poor's yields, as described in Section A-4. The return on the market is the return on the Standard and Poor's Composite Index, and the return on the New York Banks is the return on the Standard and Poor's New York Bank Index.

The regressions on the return on the market were done for the total period for which all data were available, that is, February 1929 - December, 1975. For a perspective on the overall size of "Beta" we ran the simple regression:

$$\text{Relative Change of Bank Index} = \alpha + \beta \cdot \text{Relative Change of Market Index} + \tilde{\varepsilon}$$

$\alpha$ = −.00120 t-stat = .61665

$\beta$ = .87918 t-stat = 27.38130

$R^2$ = .572

The "Beta" coefficient was of the expected sign and magnitude. The constant term was insignificantly different from zero, as anticipated. We then ran several regressions using elements in the bank's asset portfolio, that is, regressions of the form:

$$R_b = \alpha + B1 \cdot \left(\frac{\text{asset } i}{\text{capital}} \cdot R_m\right) + B2 \cdot \left(\frac{\text{all other assets}}{\text{capital}} \cdot R_m\right) + \tilde{\varepsilon}$$

where $R_b$ = relative change of bank index

$R_m$ = relative change of market index

Results are shown in Table B-1.1 for securities, loans and cash. Smaller and less aggregated categories produced nonsensical results. For example, the B1 coefficient in the regression where asset i = fixed assets was 5.5. One multiple regression was run, of the form:

$$R_b = \alpha + B1 \cdot \left(\frac{\text{loans}}{\text{capital}} \cdot R_m\right) + B2 \cdot \left(\frac{\text{securities}}{\text{capital}} \cdot R_m\right) + B3 \cdot \left(\frac{\text{other assets}}{\text{capital}} \cdot R_m\right) + \tilde{\varepsilon}$$

Results are shown in Table B-1.1 (bottom). The estimated coefficient for "other assets" is clearly unrealistic.

For completeness, levered forms were run:

$$\frac{\text{capital}}{\text{assets}} \cdot R_b = \alpha + B \cdot R_m + \tilde{\varepsilon}$$

$\alpha$ = −.0004 t-stat = −1.51278

B = .12017 t-stat = 26.92400

$R^2$ = .564

and, for the individual asset categories

$$\frac{\text{capital}}{\text{assets}} \cdot R_b = \alpha + B1 \cdot \left(\frac{\text{asset } i}{\text{total assets}} \cdot R_m\right) + B2 \cdot \left(\frac{\text{all other assets}}{\text{total assets}} \cdot R_m\right) + \tilde{\varepsilon}$$

The results of these and the analogous multiple regressions are shown in Table B-1.2. One can make the statement that over the whole period (on average) loans were three times as sensitive to market risks as were securities.*

* We tried similar regressions for other macroeconomic variables, but did not obtain reasonable estimates.

TABLE B-1.1

PCSPNYB = C+B1*(PAS1*PCSPI)+B2*((PAS-PAS1)*PCSPI)

```
NOB = 563        NOVAR = 3
RANGE =  1929 2 TO 1975 12
RSQ =    0.47328       CRSQ =    0.4714       F(2/560) =    251.589
SER =    0.0510         SSR =    1.454        DW(0) =  1.85
LHS MEAN =       0.00243      SR =       -0.
```

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| C | -0.00253 | 0.00216 | -1.16996 | 1.00000 |
| B1 | 0.00546 | 0.04609 | 0.11844 | 0.01133 |
| B2 | 0.11537 | 0.01604 | 7.19032 | 0.04245 |

| COEF | PARTIAL | BETA |
|---|---|---|
| C | -0.04938 | 0.00000 |
| B1 | 0.00500 | 0.01116 |
| B2 | 0.29072 | 0.67739 |

COVARIANCE MATRIX

| | | | |
|---|---|---|---|
| C | 4.675E-06 | | |
| B1 | 5.618E-06 | 2.124E-03 | |
| B2 | -3.007E-06 | -6.992E-04 | 2.574E-04 |

PCSPNYB = C+B1*(PAS2*PCSPI)+B2*((PAS-PAS2)*PCSPI)

```
NOB = 563        NOVAR = 3
RANGE =  1929 2 TO 1975 12
RSQ =    0.47257       CRSQ =    0.47069      F(2/560) =    250.875
SER =    0.0510         SSR =    1.456        DW(0) =  1.85
LHS MEAN =       0.00243      SR =       -0.
```

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| C | -0.00212 | 0.00216 | -0.97857 | 1.00000 |
| B1 | 0.11484 | 0.01791 | 6.41287 | 0.01716 |
| B2 | 0.07030 | 0.01172 | 5.99844 | 0.03662 |

| COEF | PARTIAL | BETA |
|---|---|---|
| C | -0.04132 | 0.00000 |
| B1 | 0.26156 | 0.36965 |
| B2 | 0.24571 | 0.34576 |

COVARIANCE MATRIX

| | | | |
|---|---|---|---|
| C | 4.673E-06 | | |
| B1 | 1.005E-06 | 3.207E-04 | |
| B2 | -1.983E-06 | -1.777E-04 | 1.374E-04 |

TABLE B-1.1
(continued)

PCSPNYB = C+B1*(PAS6*PCSPI)+B2*((PAS-PAS6)*PCSPI)

NOB = 563 NOVAR = 3
RANGE = 1929 2 TO 1975 12
RSQ = 0.47581 CRSQ = 0.47394 F(2/560) = 254.159
SER = 0.0508 SSR = 1.447 DW(0) = 1.84
LHS MEAN = 0.00243 SR = -0.

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| C | -0.00179 | 0.00216 | -0.82637 | 1.00000 |
| B1 | 0.04087 | 0.01958 | 2.08717 | 0.02409 |
| B2 | 0.10884 | 0.00958 | 11.35940 | 0.02969 |

| COEF | PARTIAL | BETA |
|---|---|---|
| C | -0.03490 | 0.00000 |
| B1 | 0.08786 | 0.10979 |
| B2 | 0.43275 | 0.59752 |

COVARIANCE MATRIX

| | | | |
|---|---|---|---|
| C | 4.674E-06 | | |
| B1 | -4.704E-06 | 3.835E-04 | |
| B2 | 9.500E-07 | -1.526E-04 | 9.180E-05 |

PCSPNYB = C+B1*(PAS2*PCSPI)+B2*(PAS6*PCSPI)+B3*((PAS1+PAS3+PAS4+PAS5)*PCSPI)

NOB = 563 NOVAR = 4
RANGE = 1929 2 TO 1975 12
RSQ = 0.47829 CRSQ = 0.47549 F(3/559) = 170.826
SER = 0.0508 SSR = 1.440 DW(0) = 1.84
LHS MEAN = 0.00243 SR = -0.

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| C | -0.00146 | 0.00217 | -0.67442 | 1.00000 |
| B1 | 0.07094 | 0.02514 | 2.82179 | 0.01716 |
| B2 | 0.01458 | 0.02535 | 0.57495 | 0.02409 |
| B3 | 0.18532 | 0.04790 | 3.86931 | 0.01254 |

| COEF | PARTIAL | BETA |
|---|---|---|
| C | -0.02851 | 0.00000 |
| B1 | 0.11851 | 0.22835 |
| B2 | 0.02431 | 0.03915 |
| B3 | 0.16151 | 0.44270 |

COVARIANCE MATRIX

| | | | | |
|---|---|---|---|---|
| C | 4.700E-06 | | | |
| B1 | -3.681E-06 | 6.321E-04 | | |
| B2 | -7.902E-06 | 2.230E-04 | 6.427E-04 | |
| B3 | 1.029E-05 | -9.996E-04 | -9.094E-04 | 2.294E-03 |

TABLE B-1.2

(LB6+LB7)/AS*PCSPNYB = C+B1*(AS1/AS*PCSPI)+B2*((AS-AS1)/AS*PCSPI)

NOB = 563 NOVAR = 3
RANGE = 1929 2 TO 1975 12
RSQ = 0.58548 CRSQ = 0.584 F(2/560) = 395.488
SER = 6.22E-03 SSR = 2.169E-02 DW(0) = 1.83
LHS MEAN = 8.78585E-05 SR = 0.

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| C | -4.47490E-04 | 2.62980E-04 | -1.70161 | 1.00000 |
| B1 | -0.16258 | 0.05234 | -3.10653 | 8.86913E-04 |
| B2 | 0.20997 | 0.01713 | 12.25880 | 0.00324 |

| COEF | PARTIAL | BETA |
|---|---|---|
| C | -0.07172 | 0.00000 |
| B1 | -0.13016 | -0.25320 |
| B2 | 0.45998 | 0.99916 |

COVARIANCE MATRIX

| | | | |
|---|---|---|---|
| C | 6.916E-08 | | |
| B1 | 3.054E-07 | 2.739E-03 | |
| B2 | -2.000E-07 | -8.450E-04 | 2.934E-04 |

(LB6+LB7)/AS*PCSPNYB = C+B1*(AS2/AS*PCSPI)+B2*((AS-AS2)/AS*PCSPI)

NOB = 563 NOVAR = 3
RANGE = 1929 2 TO 1975 12
RSQ = 0.57178 CRSQ = 0.57025 F(2/560) = 373.871
SER = 6.32E-03 SSR = 2.240E-02 DW(0) = 1.33
LHS MEAN = 8.78585E-05 SR = 0.

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| C | -3.59732E-04 | 2.67594E-04 | -1.34432 | 1.00000 |
| B1 | 0.19890 | 0.02467 | 8.06409 | 0.00121 |
| B2 | 0.07101 | 0.01578 | 4.49907 | 0.00291 |

| COEF | PARTIAL | BETA |
|---|---|---|
| C | -0.05672 | 0.00000 |
| B1 | 0.32256 | 0.49765 |
| B2 | 0.18677 | 0.27764 |

COVARIANCE MATRIX

| | | | |
|---|---|---|---|
| C | 7.161E-08 | | |
| B1 | 2.773E-07 | 6.084E-04 | |
| B2 | -3.043E-07 | -3.486E-04 | 2.491E-04 |

TABLE B-1.2
(continued)

(LB6+LB7)/AS*PCSPNYB = C+B1*(AS6/AS*PCSPI)+B2*((AS-AS6)/AS*PCSPI)

NOB = 563 NOVAR = 3
RANGE = 1929 2 TO 1975 12
RSQ = 0.57015 CRSQ = 0.56862 F(2/560) = 371.397
SER = 6.34E-03 SSR = 2.249E-02 DW(0) = 1.83
LHS MEAN = 8.78585E-05 SR = 0.

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| C | -3.29870E-04 | 2.69039E-04 | -1.22611 | 1.00000 |
| B1 | 0.03894 | 0.02842 | 1.37001 | 0.00196 |
| B2 | 0.15778 | 0.01374 | 11.48680 | 0.00216 |

| COEF | PARTIAL | BETA |
|---|---|---|
| C | -0.05174 | 0.00000 |
| B1 | 0.05780 | 0.08136 |
| B2 | 0.43668 | 0.68217 |

COVARIANCE MATRIX

| | | | |
|---|---|---|---|
| C | 7.238E-08 | | |
| B1 | -8.354E-07 | 8.078E-04 | |
| B2 | 2.683E-07 | -3.453E-04 | 1.887E-04 |

(LB6+LB7)/AS*PCSPNYB = C+B1*(AS2/AS*PCSPI)+B2*(AS6/AS*PCSPI)+B3*((AS1+AS3+AS4+AS5)/AS*PCSPI)

NOB = 563 NOVAR = 4
RANGE = 1929 2 TO 1975 12
RSQ = 0.57178 CRSQ = 0.56948 F(3/559) = 248.803
SER = 6.33E-03 SSR = 2.240E-02 DW(0) = 1.83
LHS MEAN = 8.78585E-05 SR = 0.

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| C | -3.60505E-04 | 2.69591E-04 | -1.33723 | 1.00000 |
| B1 | 0.19940 | 0.03169 | 6.29249 | 0.00121 |
| B2 | 0.07183 | 0.03627 | 1.98030 | 0.00196 |
| B3 | 0.06950 | 0.06212 | 1.11880 | 9.53608E-04 |

| COEF | PARTIAL | BETA |
|---|---|---|
| C | -0.05647 | 0.00000 |
| B1 | 0.25719 | 0.49890 |
| B2 | 0.08347 | 0.15008 |
| B3 | 0.04727 | 0.13171 |

COVARIANCE MATRIX

| | | | | |
|---|---|---|---|---|
| C | 7.268E-08 | | | |
| B1 | -3.328E-07 | 1.004E-03 | | |
| B2 | -1.308E-06 | 3.001E-04 | 1.316E-03 | |
| B3 | 1.541E-06 | -1.542E-03 | -1.712E-03 | 3.858E-03 |

SECTION B-2

## Responses of Bank Capital to Multiple Macroeconomic Variables and Implications for Capital Adequacy

The theoretical work in Sharpe[8] suggests a potentially useful way to gain information about capital adequacy. He has shown that for a bank with deposit liabilities that do not extend beyond the review period a "value preserving spread" in assets risk is likely to increase the value of the FDIC liability and the value of capital. Moreover, the less adequate the capital, the larger this effect should be. This chapter outlines the method used to develop an econometric model to test for this effect. The model is then applied to the time series data from 1938 to 1975.

We will use the theoretical framework from Sharpe [1978]. To begin,

(1) $$C = L + A - DF$$

where C = value of capital, time zero,

L = value of the FDIC liability, time zero,

A = value of the assets, time zero,

DF = default-free value of dposits, time zero.

This identity comes from the bank's economic balance sheet. Hence

(2) $$\Delta C = \Delta L + \Delta A - \Delta DF.$$

If assets become more risky but do not change in value, there will generally be a change in L. This will be a function of the value of the

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[8] W. F. Sharpe, "Basic Capital Adequacy, Deposit Insurance and Security Values," paper presented at the Western Finance Association Meeting, June 1978.

assets, the increase in risk per dollar of assets and risk of the bank's deposits:

$$\Delta L = b_r \cdot \Delta_{rs} A, \tag{3}$$

where $\Delta_{rs}$ = the change in risk per dollar of assets,[9] and

$b_r$ = the bank's risk shift sensitivity.[10]

Substituting (3) into (2) and dividing by capital:

$$\frac{\Delta C}{C} = \frac{\Delta A}{C} - \frac{\Delta DF}{C} + b_r \Delta_{rs} \frac{A}{C}. \tag{4}$$

Breaking assets and liabilities into classes:

$$\frac{\Delta A}{C} = \sum_i \frac{\Delta A_i}{A_i} \frac{A_i}{C} \tag{5}$$

where: $A_1$, $A_2$ . . . are the values of assets in classes 1, 2 .... .

$$\frac{\Delta DF}{C} = \sum_i \frac{\Delta DF_i}{DF_i} \frac{DF_i}{C} \tag{6}$$

where: $DF_1$, $DF_2$ . . . are the default-free values of liabilities in classes 1,2,...n.

The relative change in each asset or liability value may be attributed to the unanticipated relative changes in relevant macroeconomic variables with the magnitudes determined by response coefficients of the balance sheet items to the macroeconomic variables:

$$\frac{\Delta A_i}{A_i} = \sum_j b_{ij} M_j \tag{7}$$

$$\frac{\Delta DF_i}{DF_i} = \sum_j b_{ij} M_j, \tag{8}$$

---

[9] $\Delta_{rs}$ corresponds to the variable R in Sharpe [1978].

[10] $b_r$ corresponds to the expression $[-\sum_{s=1}^{K} (p_s \Delta_s^a)]$ in Sharpe [1978].

where $M_j$ = relative unanticipated change in macroeconomic variable j,

$b_{ij}$ = response coefficient of value of balance sheet item itto un unanticipated change in macroeconomic variable j.

Equation (4) may be rewritten

$$(4') \qquad \frac{\Delta C}{C} = \sum_i \sum_j [b_{ij}(X_i M_j)] \; b_r \; \Delta_{rs} \frac{A}{C},$$

$$\text{where } X_i = \begin{cases} \dfrac{\text{value of the asset}}{\text{value of the equity}} & \text{for each asset } i \\[2ex] \dfrac{-\text{value of the liability}}{\text{value of the equity}} & \text{for each liability } i. \end{cases}$$

For time series data we would like to run a regression of the form:

$$(9) \qquad \text{Return on the bank stock index} = \text{constant} + \sum_i \sum_j [b_{ij}(X_i M_j)] + b_r \Delta_{rs} \frac{A}{C} + \tilde{\varepsilon},$$

where $\Delta_{rs}$ is a measure of changes of risk in the economy. The constant term is added to the regression as an additional test of the robustness of the empirical model. The constant term is expected not to be significantly different from zero for any of the regressions. Macroeconomic variables that should affect the <u>value</u> of the assets and liabilities include (1) changes in the term structure of interest rates, since the bank is an institution which borrows short and lends long, and (2) changes in the present value of the market portfolio of risky assets.

The data series we have are so crude that it would be unreasonable to run a regression of the desired form. Our data force us to use ratios of book values rather than ratios of economic values for the $X_i$'s. Using book values, multicollinearity of the $X_i \cdot M_j$ independent variables is very high since the macroeconomic variables have a high variance relative to book values. Thus the products $X_i \cdot M_j$ and $X_k \cdot M_j$ (for all i, k) will be highly correlated.

This would be true even if the $X_i$'s themselves were uncorrelated or negatively correlated. For example, for the period January 1938 to December 1975:

| Variable | Variable | Correlation |
|---|---|---|
| loans/capital | investments/capital | -.743 |
| (loans/capital)$\cdot R_m$ | (investments/capital)$\cdot R_m$ | .879 |
| (loans/capital)·cggovs | (investments/capital)·cggovs | .937 |
| (loans/capital)·cggovl | (investments/capital)·cggovl | .926 |

where $R_m$ = relative change in the market index,

cggovs = capital gains on short-term government bonds,

cggovl = capital gains on long-term government bonds.

The book value balance sheet data used in these correlations and in the regressions for this section were computed from the Federal Reserve data for Large New York Banks or Reserve City Member Banks of New York as described in Section A-2. The interest rate data (yields, capital gains, and total returns) are computed from the Standard and Poor's indices as described in Section A-4. The return on the market and the return on the New York City and Outside New York City banks were computed from Standard and Poor's Composite Index, New York City Bank Index and Outside New York City Bank Index, respectively.

We chose those elements of the bank's portfolio on which each macroeconomic variable is likely to have the largest effect, giving a regression of the form:

$$\text{Return on the bank stock index} = \text{constant} + \sum_{\text{selected } i} \sum_j [b_{ij}(X_i M_j)] + b_r \Delta_{rs} X_k$$

where k is an asset class assumed to be responsible for the risk shift. Returns on the market were assumed to influence the value of loans, as was any change in the risk of the economy. Changes in the long rate were assumed to affect the values of long-term assets (primarily government securities). Changes in short rates were assumed to influence deposits. The regressions could only be run for the New York banks, since balance sheet data were not available for the outside New York banks.

One would expect that an unanticipated increase in the level of the stock market would increase the value of risky assets (i.e. loans) and hence the value of equity. An unanticipated increase in short-term rates should decrease the value of short-term liabilities, and, ceteris paribus, increase the value of equity. If (a) there are no monopoly returns to deposits, and (b) deposits de facto have a duration greater than zero, they may be considered a bond issued by the bank, which must pay out a fixed coupon consisting of interest plus services with a total value equal to the short-term market interest rate. If the short-term rate increases, the bank could buy back deposits at less than par and incur a capital gain. As a proxy for this variable one could use either yield changes or capital gains. Capital gains and yield changes are related by a negative nonlinear transform. We feel capital gains are a better measure than yield changes for two reasons: (1) they are in the same units as the dependent variable (relative change per month) and are hence easily interpretable, and (2) they are expected to have a linear relationship with changes in the dependent variable, whereas yield changes are not.[11]

An unanticipated increase in the long-term rate should decrease the value of long-term assets (i.e., government securities) and thus decrease the value of equity. The effect of a change in the risk of the economy is not clear. If capital is completely adequate (that is, in no states of the

---

[11]We tried yield changes in many of the regressions instead of capital gains. Results rarely changed by more than one-fifth of a standard deviation.

world will the bank default) and the assets get riskier but maintain their value, neither the value of deposits nor that of chapital should change. If capital is inadequate and a "value-preserving spread" occurs, the economic value of the deposits should fall and the value of the capital should rise. If an increase in the riskiness of the economy decreases the value of the bank's assets and increases the riskiness of the bank's assets, and capital is completely adequate, the whole decrease in the value of the assets should fall on capital. If capital is inadequate, an increase in the riskiness of the economy should not lower the value of capital by as much as the decrease in the value of the assets, and may raise it. By using both the return on the market and risk shift in our regressions, we hoped to capture the effect of a risk shift in one coefficient and the effect of a change in the value of assets in the other.

Results for the period January 1938 to December 1975 are shown in Table B-2.1. The difference between the BBB corporate bond yield to maturity and that on government long-term bonds was taken as a proxy for the riskiness of the corporate sector. $\Delta_{rs}$ refers to the first differences of the series which were used as a proxy for changes in the riskiness of the economy. Coefficients B1 and B2 have the expected sign. We anticipated a negative sign on B3, but the coefficient is effectively zero. The coefficient on B4 suggests that there was inadequate capital for the New York Banks. To see if the New York Banks became more risky over time, we divided the data into two periods 1938-1956 and 1957-1975. The previous equation was rerun for both groups. Results are shown in Table B-2.2. The size and sign of the B4 coefficient for the earlier period suggests that we have not adequately controlled for our "value preserving spread." We partitioned our observations into four equal groups: 1938-June, 1947; July 1947-56; 1957-June, 1966;

and July, 1966-1975 and repeated the regression. Results are shown in Table B-2.3. They suggest capital has gradually been becoming more inadequate over the period. Note the constant term is insignificantly different from zero in all these results.

We realized that if balance sheet values have any meaning for capital adequacy and we repartition by the balance sheet measure of capital adequacy, our results should be better than partitioning by time. We did not expect results a great deal better, for as seen in Section A-3, traditional measures of capital adequacy have deteriorated over time, and would hence tend to be heavily correlated with time. This could allow us to choose among various measures of capital adequacy. The "better" measures should yield better fits (i.e., higher $R^2$) when used for partitioning. We used a "reasonable" measure of capital adequacy to see if it performed better than time. We chose the ratio $\frac{\text{assets-acceptances-capital}}{\text{loans}}$. The rationale for this ratio is that acceptances do not belong on both sides of the economic balance sheet; only the option value belongs on the liability side. This ratio is roughly "deposits"/loans. Note that "deposits" includes borrowings and other liabilities. We included borrowing because when the bank begins to get risky, borrowing will be the first liability to leave. Dividing our observations into two equal groups, those in which the New York Banks had a high "deposit"/loan ratio (safe observations) and those in which they had a low "deposit"/loan ratio (risky observations), the $R^2$ tends, on average, to be higher as shown in Table B-2.4. Capital seems to be adequate for the safe group and inadequate for the risky group. The observations were redivided into four equal parts, and the measure seems to perform somewhat better than time alone (as shown in Table B-2.5).

This experiment was rerun using the ratio $\frac{\text{assets-acceptances-capital}}{\text{assets-acceptances}}$, which is roughly equal to "deposits"/"assets". First the observations were divided into two groups (as shown in Table B-2.6), then four groups (as shown in Table B-2.7). This ratio did not perform as well as either "deposits"/loans or time.

Unfortunately, this test is not really powerful enough to assess various measures of capital adequancy. Our results appear promising enough to repeat using cross section data.

TABLE B-2.1

PCSPNYB = C+B1*(PAS2*PCSPI)+B2*(PAS6*CGGOVL)+B3*((PLB1+PLB2)*CGGOVS)+B4*(PAS2* $\Delta_{rs}$)

NOB = 456 NOVAR = 5
RANGE = 1938 1 TO 1975 12
RSQ = 0.4229 CRSQ = 0.41776 F(4/451) = 82.622
SER = 0.0376 SSR = 0.638 DW(0) = 2.03
LHS MEAN = 0.00464 SR = 0.

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| C | 9.01015E-04 | 0.00179 | 0.50330 | 1.00000 |
| B1 | 0.14449 | 0.00819 | 17.63930 | 0.02466 |
| B2 | 0.03947 | 0.05811 | 0.67928 | -0.00200 |
| B3 | 3.29761E-04 | 0.03186 | 0.01035 | -0.00412 |
| B4 | 6.10624 | 3.00967 | 2.02888 | 4.13107E-05 |

| COEF | PARTIAL | BETA |
|---|---|---|
| C | 0.02369 | 0.00000 |
| B1 | 0.63894 | 0.64234 |
| B2 | 0.03197 | 0.03232 |
| B3 | 4.87355E-04 | 4.57675E-04 |
| B4 | 0.09510 | 0.08316 |

COVARIANCE MATRIX

| | | | | | |
|---|---|---|---|---|---|
| C | 3.205E-06 | | | | |
| B1 | -1.965E-06 | 6.710E-05 | | | |
| B2 | 6.882E-06 | -5.075E-05 | 3.377E-03 | | |
| B3 | 3.090E-06 | -1.886E-05 | -9.313E-04 | 1.015E-03 | |
| B4 | -6.142E-04 | 3.165E-03 | -6.574E-02 | -7.430E-03 | 9.058E+00 |

TABLE B-2.2

PCSPNYB = C+B1*(PAS2*PCSPI)+B2*(PAS6*CGGOVL)+B3*((PLB1+PLB2)*CGGOVS)+B4*(PAS2* $\Delta_{rs}$)

NOB = 228 NOVAR = 5
RANGE = 1938 1 TO 1956 12
RSQ = 0.46503 CRSQ = 0.45544 F(4/223) = 48.462
SER = 0.0313 SSR = 0.218 DW(0) = 1.96
LHS MEAN = 0.00405 SR = 0.

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| C | -4.38632E-04 | 0.00214 | -0.20522 | 1.00000 |
| B1 | 0.13374 | 0.01652 | 8.09549 | 0.03017 |
| B2 | 0.17101 | 0.06913 | 2.47390 | -0.00102 |
| B3 | 0.01152 | 0.08167 | 0.14103 | -0.00364 |
| B4 | -64.42190 | 12.32510 | -5.22687 | -1.04445E-05 |

| COEF | PARTIAL | BETA |
|---|---|---|
| C | -0.01374 | 0.00000 |
| B1 | 0.47659 | 0.46890 |
| B2 | 0.16344 | 0.17307 |
| B3 | 0.00944 | 0.00884 |
| B4 | -0.33037 | -0.33421 |

COVARIANCE MATRIX

| | | | | | |
|---|---|---|---|---|---|
| C | 4.568E-06 | | | | |
| B1 | -7.356E-06 | 2.729E-04 | | | |
| B2 | -1.491E-06 | -3.115E-04 | 4.778E-03 | | |
| B3 | 2.082E-05 | 1.874E-05 | -3.245E-03 | 6.670E-03 | |
| B4 | -1.914E-03 | 1.080E-01 | -3.773E-01 | 3.933E-02 | 1.519E+02 |

PCSPNYB = C+B1*(PAS2*PCSPI)+B2*(PAS6*CGGOVL)+B3*((PLB1+PLB2)*CGGOVS)+B4*(PAS2* $\Delta_{rs}$)

NOB = 228 NOVAR = 5
RANGE = 1957 1 TO 1975 12
RSQ = 0.46219 CRSQ = 0.45255 F(4/223) = 47.912
SER = 0.0410 SSR = 0.376 DW(0) = 1.94
LHS MEAN = 0.00522 SR = -0.

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| C | 0.00191 | 0.00279 | 0.68199 | 1.00000 |
| B1 | 0.13330 | 0.01023 | 13.02510 | 0.01915 |
| B2 | 0.04579 | 0.12206 | 0.37515 | -0.00298 |
| B3 | -0.00772 | 0.04140 | -0.18652 | -0.00459 |
| B4 | 9.26238 | 3.85614 | 2.40199 | 9.30660E-05 |

| COEF | PARTIAL | BETA |
|---|---|---|
| C | 0.04562 | 0.00000 |
| B1 | 0.65732 | 0.65456 |
| B2 | 0.02511 | 0.03116 |
| B3 | -0.01249 | -0.01271 |
| B4 | 0.15881 | 0.15398 |

COVARIANCE MATRIX

| | | | | | |
|---|---|---|---|---|---|
| C | 7.806E-06 | | | | |
| B1 | -3.085E-06 | 1.047E-04 | | | |
| B2 | 5.884E-05 | -1.949E-04 | 1.490E-02 | | |
| B3 | -3.890E-06 | -5.242E-06 | -3.205E-03 | 1.714E-03 | |
| B4 | -2.182E-03 | 5.099E-03 | -2.735E-01 | 2.492E-02 | 1.487E+01 |

TABLE B-2.3

PCSPNYB = C+B1*(PAS2*PCSPI)+B2*(PAS6*CGGOVL)+B3*((PLB1+PLB2)*CGGOVS)+B4*(PAS2*$\Delta_{rs}$)

NOB = 114 NOVAR = 5
RANGE = 1938 1 TO 1947 6
RSQ = 0.69432 CRSQ = 0.68311 F(4/109) = 61.896
SER = 0.0302 SSR = 9.936E-02 DW(0) = 1.71
LHS MEAN = 0.00287 SR = 0.

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| C | -0.00329 | 0.00289 | -1.13781 | 1.00000 |
| B1 | 0.23861 | 0.02853 | 8.36366 | 0.01497 |
| B2 | 0.08768 | 0.08142 | 1.07682 | 0.00295 |
| B3 | 0.09451 | 0.11950 | 0.79088 | -0.00117 |
| B4 | -80.61950 | 19.62730 | -4.10753 | -3.02453E-05 |

| COEF | PARTIAL | BETA |
|---|---|---|
| C | -0.10834 | 0.00000 |
| B1 | 0.62522 | 0.60979 |
| B2 | 0.10260 | 0.08644 |
| B3 | 0.07554 | 0.05440 |
| B4 | -0.36611 | -0.32171 |

COVARIANCE MATRIX

| | | | | | |
|---|---|---|---|---|---|
| C | 8.367E-06 | | | | |
| B1 | 1.712E-06 | 8.139E-04 | | | |
| B2 | -3.567E-05 | -9.642E-04 | 6.630E-03 | | |
| B3 | 3.303E-05 | -2.381E-04 | -5.054E-03 | 1.428E-02 | |
| B4 | 8.357E-03 | 3.747E-01 | -8.144E-01 | -7.259E-02 | 3.852E+02 |

PCSPNYB = C+B1*(PAS2*PCSPI)+B2*(PAS6*CGGOVL)+B3*((PLB1+PLB2)*CGGOVS)+B4*(PAS2*$\Delta_{rs}$)

NOB = 114 NOVAR = 5
RANGE = 1947 7 TO 1956 12
RSQ = 0.26853 CRSQ = 0.24169 F(4/109) = 10.004
SER = 0.0235 SSR = 6.039E-02 DW(0) = 2.25
LHS MEAN = 0.00524 SR = 0.

| COEF | VALUE | ST ER | T-STAT | MEAN |
|---|---|---|---|---|
| C | 0.00283 | 0.00242 | 1.17320 | 1.00000 |
| B1 | 0.06601 | 0.01566 | 4.21507 | 0.04538 |
| B2 | 0.16686 | 0.12273 | 1.35956 | -0.00499 |
| B3 | -0.08653 | 0.09137 | -0.94699 | -0.00611 |
| B4 | -30.50440 | 13.27950 | -2.29710 | 9.35622E-06 |

| COEF | PARTIAL | BETA |
|---|---|---|
| C | 0.11167 | 0.00000 |
| B1 | 0.37437 | 0.38705 |
| B2 | 0.12913 | 0.18212 |
| B3 | -0.09033 | -0.10914 |
| B4 | -0.21488 | -0.25376 |

COVARIANCE MATRIX

| | | | | | |
|---|---|---|---|---|---|
| C | 5.835E-06 | | | | |
| B1 | -1.309E-05 | 2.452E-04 | | | |
| B2 | 5.110E-05 | -3.138E-04 | 1.506E-02 | | |
| B3 | 7.422E-06 | 7.626E-05 | -7.590E-03 | 8.348E-03 | |
| B4 | -8.672E-03 | 9.201E-02 | -8.688E-01 | 2.430E-01 | 1.763E+02 |