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Federal Reserve Bank of Richmond

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March 28, 1986

To Our Member Banks:

We are pleased to present the 1985 Annual Report of the Federal Reserve Bank of Richmond. The Report's feature article describes and analyzes the methods the Federal Reserve has developed to price its correspondent banking and payments services. The Report also includes highlights of the year; a summary of operations; comparative financial statements; and current lists of directors and officers of our Baltimore, Charleston, Charlotte, Columbia, Culpeper, and Richmond Offices.

On behalf of our directors and staff, we wish to thank you for the cooperation and support you have extended to us throughout the past year.

Sincerely yours,

Chairman of the Board

Robt O Black

President

AN ANALYSIS OF FEDERAL RESERVE PRICING

*Anatoli Kuprianov**

I. INTRODUCTION

In 1981 the Federal Reserve System adopted a new pricing policy for certain correspondent banking and other services, such as check clearing and settlement, supplied by Reserve Banks. The new policy was mandated by the Monetary Control Act of 1980, which gave all depository institutions equal access to Federal Reserve clearing services and required that prices charged for those services be set so as to reflect all costs of production, including an allowance for taxes, a return to capital, and all other expenses a private sector firm would bear.

Federal Reserve Banks have supplied correspondent banking services to the banking industry throughout most of their history. Before 1980 only member banks had direct access to all Federal Reserve clearing services. They received these services free of charge as partial compensation for the cost of the non-interest-bearing reserves they were required to hold. Private correspondent banks and clearinghouses supplied clearing services to nonmember banks and other depository institutions such as thrifts and credit unions.

When Congress granted equal access to Federal Reserve services it recognized that this action would put the Fed in more direct competition with private correspondent banks. The pricing requirements included in the act were intended to enable private firms to compete with the Fed. Pricing was also seen as a way of encouraging more rational resource utilization, since there was little incentive to conserve on the use of Fed services when no explicit prices were charged.[1]

This article describes and evaluates the pricing methods adopted by the Federal Reserve. Issues related to Fed pricing can be divided into two categories. The first pertains to the determination of imputed private sector costs; the second to the allocation of those costs to individual service prices. Sections II and III describe and analyze the methods used in cost determination, while Sections IV and V do the same for cost allocation. Conclusions are stated in Section VI.

II. IMPUTING THE COST OF CAPITAL TO THE FEDERAL RESERVE

The cost of capital is by far the most important of the costs the Federal Reserve must impute to its priced services. Accordingly, most of the analysis of cost determination focuses on capital financing costs. A detailed description of the methods used to determine imputed costs follows a review of some relevant aspects of the theory of capital finance.

Factors Determining the Cost of Capital

Capital goods, by definition, yield a stream of productive services over an extended length of time. The cost of capital refers to the price of capital services. As the name suggests, the cost of capital measures opportunity cost. It is the expected rate of return on alternative investment opportunities that bear the same amount of risk.

Investors in financial markets determine the cost of capital. Firms finance capital investment through the sale of financial assets such as equity shares, or stocks, and bonds. Market prices of those financial

* This article grew out of a research project originally undertaken with Ward McCarthy, formerly an economist with the Federal Reserve Bank of Richmond, but currently associated with Merril Lynch Economics. In addition to Mr. McCarthy, the author wishes to acknowledge helpful comments by Marvin Goodfriend, David Humphrey, Tom Humphrey, David Mengle, Bruce Summers, and John Walter. Any remaining errors or omissions are the sole responsibility of the author.

[1] Another reason Congress required the Fed to price certain of its services was to offset the cost to the U. S. Treasury of the lower reserve requirements brought about by the Monetary Control Act. Revenue considerations were not responsible for the legislative provisions requiring the Fed to recover imputed private sector costs, however. Instead, those provisions were intended to foster competition and promote efficient resource allocation, as noted in the text. A detailed account of the legislative debate over Federal Reserve pricing can be found in Anatoli Kuprianov, "The Monetary Control Act and the Role of the Federal Reserve in the Interbank Clearing Market," Federal Reserve Bank of Richmond, **Economic Review** 71 (July/August 1985): 23-35.

assets reflect the return on capital the firm is expected to earn. All other things equal, the lower the expected return the lower will be the market value of a firm's outstanding financial assets. Because investors typically demand a premium in exchange for greater risk, the cost of capital is higher for firms that undertake riskier investments.

A firm's cost of capital can be expressed as the total expected return to investors divided by the market value of outstanding financial assets. That ratio, in turn, can be expressed as a weighted average of the expected rate of return to equity and the interest rates paid on outstanding debt.

In a market economy prices allocate resources. The cost of capital, as determined in financial markets, determines how capital is allocated. A firm will invest in capital if the expected rate of return on investment is at least equal to the cost of capital at the margin; otherwise, the market value of its outstanding equity will fall until the expected rate of return to shareholders once again equals the expected return on other investments bearing equivalent risks. Assuming firms attempt to maximize their market value, capital will be allocated to investments with the highest expected return for a given amount of risk. A firm that is unable to earn a rate of return at least equal to its cost of capital over the long run will experience difficulty in attracting capital from investors.

The Cost of Capital to the Federal Reserve

Federal Reserve Banks, because of their unique status as quasi-governmental agencies, are not subject to the same market forces confronting private firms. Although they are legally privately owned institutions, their stock is issued only to member banks and cannot be bought or sold in financial markets. Moreover, dividends paid on that stock are fixed by law at a six percent annual rate, with all remaining revenues net of expenses turned over to the U. S. Treasury. Thus, unlike a purely private firm, the cost of capital to the Fed is not determined in financial markets. Nevertheless, capital acquired by the Fed does have an opportunity cost. For capital used in the production of priced clearing services, that opportunity cost is reflected in the cost of capital faced by its competitors in the private sector.

Capital Structure Assumptions

Total imputed financing costs for Federal Reserve priced service operations are determined by the asset base (the value of capital assets devoted to priced services), the assumed capital structure (the proportions of equity and debt used to finance the asset base), and the imputed rate of return to equity and interest rates on debt. Table I summarizes the capital structure assumptions applied to the priced services asset base. Overall capital structure is determined by matching different types of assets with separate funding sources. This *matched-book capital structure,* as it is termed, treats long-term assets as being financed by a mix of equity and long-term debt, while short-term assets are assumed to be financed by short-term debt.

Assets classified as long-term are physical assets, such as buildings and equipment. Short-term assets consist of working capital; that is, funds needed to conduct a firm's day-to-day transactions. Prepaid expenses, materials and supplies, and receivable accounts reflect such funding needs.

Imputed financing costs for the assets listed in Table I are recovered using two different methods. The Fed distinguishes between assets directly related to the production of priced clearing services and other assets used to facilitate the clearing and settlement of payments transactions. Financing costs for long-term assets and working capital are determined using a financial model of large bank holding companies and recovered through a mark-up added to service prices. Self-financing assets earn separate and identifiable income streams apart from the fee income earned from the sale of priced clearing services.

Two types of self-financing assets are listed in Table I. The first is Federal Reserve float. The cost of float is largely recovered through separate charges against institutions that receive credit for checks and other items before the Fed receives the funds for those items. Clearing balances are deposits held with Reserve Banks (in addition to required reserves) to facilitate the transfer of funds associated with the transactions they process.[2] Funds obtained from clearing balance deposits are assumed to be invested in short-term government securities. This

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[2] Although the Monetary Control Act imposes uniform reserve requirements on all depository institutions, some institutions may not hold sufficient reserves directly with Reserve Banks to facilitate clearing and settlement. Situations such as this can arise because reserve requirements can be satisfied by vault cash holdings or by reserve accounts, known as pass-through reserve accounts, administered by private correspondent banks for their respondents. Institutions are required to hold separate clearing balance deposits as a condition for receiving Fed services in these cases to prevent the occurrence of overnight overdrafts. Banks that otherwise hold sufficient reserves for clearing purposes can also hold clearing balances in addition to required reserves.

Table I

THE MATCHED CAPITAL STRUCTURE ASSUMPTION

ASSETS:	FINANCED BY:
Long-Term	
Premises	Equity and long-term debt[1]
Furniture and equipment	
Leases and leasehold improvements	
Short-term	
Working Capital:	
Receivables	Short-term debt[1]
Materials and supplies	
Prepaid expenses	
Self-Financing Assets:	
Net items in the process of collection (float)	Balances arising from early credit of uncollected items[2]
Imputed reserve requirements	Clearing balances[3]
Investment in marketable securities	

[1] Imputed financing costs determined using the bank holding company model.

[2] Imputed cost is the federal funds rate.

[3] Cost of funds determined by the earnings credit rate paid on clearing balances deposited with Federal Reserve Banks.

Source: Board of Governors of the Federal Reserve System, "Financial Results of Federal Reserve Priced Services Operations," (November 20, 1985).

assumption is reflected in the two asset accounts corresponding to clearing balance liabilities in Table I. The Federal Reserve pays implicit interest on designated clearing balances in the form of earnings credits that can be used to pay for its priced services. Imputed earnings on the funds placed in the corresponding asset accounts offset the cost of these earnings credits to the Federal Reserve. The treatment of self-financing assets is described in greater detail at the end of this section.

The Bank Holding Company Model

A financial model of large bank holding companies is used to impute a cost of capital to the Federal Reserve. The bank holding company model adopted by the Fed uses financial data on the twenty-five largest bank holding companies in the United States to estimate the average pre-tax rate of return on capital for the sample.[3] That estimated rate of return is then used to determine a targeted rate of return on long-term assets and working capital. As noted above, imputed financing costs for these two categories of assets are recovered through a mark-up added to service prices.

The resulting targeted rate of return is a pre-tax rate. It reflects both the imputed after-tax rate of return and corporate income taxes that would be levied against the pre-tax return. The pre-tax rate of return to capital can be expressed as a weighted average of the pre-tax rate of return to equity and the interest rates paid on outstanding debt. Formally stated, that expression is

$$r = a_1 \left(\frac{r_1}{1-t}\right) + a_2 r_2 + a_3 r_3,$$

where the variable r represents the aggregate pre-tax rate of return to capital, r_1 the after-tax rate of return to equity, t the average corporate tax rate, r_2 the average interest rate paid on long-term debt, r_3 the average short-term interest rate, and a_1, a_2, and a_3 the proportions of equity, long-term debt, and short-term debt used to finance capital investment.

Accounting data taken from the financial statements of the bank holding company sample are used

[3] Because of unique circumstances, one of the twenty-five largest bank holding companies was removed from the sample used to calculate the targeted rate of return for 1986, and another holding company was substituted in its place. 50 **Federal Register** 47,624 (November 19, 1985).

to construct an estimate of the average pre-tax rate of return. An estimated rate of return calculated on the basis of accounting data is termed a *book* rate of return. Book rates of return can be contrasted with market rates, which are calculated using market data on actual returns earned by investors. A formal derivation of the rate of return formula used in the bank holding company model is presented in the shaded box on the opposite page. A description of how the variables appearing in that formula are calculated follows.

The procedure used to determine the average rate of return earned by the bank holding company sample can be divided into three steps. First, the pre-tax rate of return to equity, $r_1/(1-t)$, is estimated. This term measures both the cost of equity finance and corporate income taxes. Second, interest rates on long-term debt, r_2, and short-term debt, r_3, are estimated. Third, the assumed financial structure (reflected by the weights a_1, a_2, and a_3) is determined.[4]

The Pre-Tax Rate of Return to Equity Determining the pre-tax rate of return to equity requires three steps. In the first step the after-tax rate of return is calculated by dividing after-tax profits by the book value of outstanding equity. This yields an estimate of the variable r_1.

Average corporate income tax rates are estimated by dividing actual taxes paid, with an adjustment that adds back the tax benefits that banks get from holding municipal bonds, by gross income. Deferred taxes are excluded from the estimated tax rate. The imputed tax rate is then determined as a weighted average of the estimated tax rates for each of the holding companies in the sample. The weights used to compute the sample average are individual holding company profits divided by total profits for the entire sample.

Finally, the pre-tax rate of return to equity is determined by dividing the after-tax rate, r_1, by $(1-t)$, where t denotes the average tax rate. The values of r_1 and t used in this final step are three-year moving averages of the sample averages.

Interest Rates An imputed interest rate on long-term debt is determined by averaging the interest rates paid on all outstanding long-term debt for the holding companies sampled. The short-term interest rate is estimated in the same way, except that demand deposits and other deposits subject to interest rate ceilings are excluded from the calculation. Because banks often pay implicit interest in the form of free gifts or services for deposits subject to interest rate ceilings, explicit interest rates provide downwardly biased estimates of the true cost of these funds. Since implicit interest payments are difficult to estimate, all such deposits are excluded from the calculation of the cost of short-term debt finance.

Capital Structure The weights a_1, a_2, and a_3 appearing in the bank holding company rate of return formula are determined on the basis of the matched-book capital structure assumption described earlier. Long-term assets are assumed to be financed by a mix of equity and long-term debt. Proportions of equity and long-term debt, represented by the variables a_1 and a_2, are based on the corresponding proportions observed for the bank holding company sample. The sum $a_1 + a_2$ is determined so as to equal the proportion of long-term assets in the bank holding company model asset base, which is composed of long-term assets and working capital. The variable a_3 is the share of working capital in the asset base. The cost of finance for working capital is r_3, the short-term interest rate.

Other Imputed Private Sector Costs

The estimate of the pre-tax cost of capital obtained using the bank holding company model includes an imputed allowance for the cost of corporate income taxes. However, Federal Reserve Banks, because of their nonprofit status, are also exempt from certain sales taxes that private firms are required to pay. A separate allowance for such taxes is therefore added to the total cost recovery target.

Other imputed expenses include an allowance for federal deposit insurance assessments, based on total clearing balances, and Federal Reserve Board staff expenses attributable to priced services development. As part of this last allocation, a portion of Board assets are added to the priced services asset base.[5]

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[4] Information on the bank holding company model was gathered from a series of **Federal Register** notices published by the Federal Reserve Board: 46 **Federal Register** 1,338 (January 6, 1981); 49 **Federal Register** 11,251 (March 26, 1984); 49 **Federal Register** 44,556 (November 7, 1984); and 50 **Federal Register** 47,624 (November 19, 1985).

[5] 49 **Federal Register** 11,251 (March 26, 1984).

The Rate of Return to Capital as a Weighted Average of Interest Rates and the Return to Equity

The financial model of large bank holding companies used by the Federal Reserve to determine its imputed cost of capital is based on a formula that breaks down the aggregate rate of return to capital into a weighted average of the pre-tax rate of return to equity and the interest rates paid on long- and short-term debt. In the derivation that follows, all variables represent accounting data that appear in bank holding company financial statements.

Consider a firm that finances its investments by issuing a mix of equity shares, long-term debt, and short-term debt. Let the variable s represent the book value of the firm's outstanding equity, b_1 the book value of long-term debt, and b_2 the value of short-term debt. The aggregate book value, v, of all claims against the firm's revenues is

$$v = s + b_1 + b_2 .$$

Now let the variable q denote revenues net of operating expenses. The pre-tax book rate of return to capital, represented by the variable r, is the ratio of pre-tax earnings to the aggregate book value of all claims held by investors against the firm's income stream. In formal terms,

$$r = \frac{q}{v} .$$

Taxable profits, denoted by the variable π, are determined by subtracting total interest payments on outstanding debt from net before-tax revenues. If c_1 and c_2 represent outstanding interest payment obligations on long- and short-term debt, then taxable profits are

$$\pi = q - c_1 - c_2 .$$

After-tax profits are $(1-t)\pi$, where t represents the corporate income tax rate.

Using the definition of taxable profits, the pre-tax rate of return to capital can be alternatively stated as

$$r = \frac{\pi + c_1 + c_2}{v} .$$

The last expression can be restated as a weighted average of the pre-tax rate of return to equity and the average yields paid on long- and short-term debt. To see this, first note that the pre-tax rate of return to equity, denoted by the variable r_e, is the ratio of pre-tax profits to the value of outstanding equity. Formally,

$$r_e = \frac{\pi}{s} .$$

The average yields on long-term debt, r_2, and short-term debt, r_3, are defined as

$$r_2 = \frac{b_1}{c_1}$$

and

$$r_3 = \frac{b_2}{c_2} .$$

Now let a_1, a_2, and a_3 denote the proportions of equity, long-term debt, and short-term debt the firm uses to finance its investments. By definition,

$$a_1 = \frac{s}{v}$$

$$a_2 = \frac{b_1}{v}$$

$$a_3 = \frac{b_2}{v} .$$

Using these definitions, the pre-tax rate of return to capital can be expressed as

$$r = a_1 r_e + a_2 r_2 + a_3 r_3 .$$

As a final step, let $r_1 = (1-t)\pi/s$ denote the after-tax rate of return to equity. Then, the pre-tax rate of return can be expressed as a function of the after-tax rate,

$$r_e = \frac{r_1}{1-t} .$$

Substituting this last expression into the weighted average rate of return formula derived above yields

$$r = a_1 \left(\frac{r_1}{1-t}\right) + a_2 r_2 + a_3 r_3 ,$$

which is the formula stated in the text.

Self-Financing Assets

Three of the asset accounts listed in Table I are classified as self-financing: float, imputed reserve requirements on clearing balances, and investment in marketable securities. How financing costs for these assets are determined and recovered are described below.

Clearing Balances The accounts labeled imputed reserve requirements on clearing balances and investment in marketable securities shown in Table I stem from clearing balances deposited with Reserve Banks by commercial banks and other depository institutions. Clearing balances held on deposit with the Federal Reserve earn interest in the form of earnings credits that can be used to pay for clearing services. Earnings credits accruing to clearing balances are computed at a rate of interest that approximates the competitive rate private correspondents would pay on equivalent deposits. That interest rate is determined using the prevailing federal funds rate, with an adjustment to reflect the marginal cost of the added reserve requirements a correspondent bank would be required to hold against such deposits. According to calculations performed by the Federal Reserve Board staff, this adjustment reduces the rate paid on clearing balances by seven percent.[1]

Correspondent banks are subject to a twelve percent required reserve ratio on balances deposited by their respondents. Accordingly, twelve percent of the funds the Federal Reserve receives from clearing balance deposits are allocated to the imputed reserve requirements account, which is assumed to earn no interest. The remaining funds are allocated to the investment in marketable securities account. Funds in that account are assumed to be invested in three-month Treasury bills.

Float Float is created when the Federal Reserve makes the funds from a payments transaction available to a receiving bank before they are obtained from the payor. As such, it represents an extension of credit to the banking system and is included as a short-term asset on the balance sheet of the Federal Reserve. Almost all float results from check-clearing activities, although small amounts can also arise from automated clearinghouse (ACH) transactions.[2]

The Monetary Control Act classifies float as a separate service subject to pricing. It requires float to be valued at the prevailing federal funds rate and recovered through pricing. The cost of float is recovered by a number of different methods depending on the factors responsible for its creation and the choice of payments options depository institutions make.

Funds for checks cleared through Federal Reserve offices are made available according to fixed availability schedules. For example, funds for checks drawn against institutions in the same district are typically made available to the receiving institution on the next business day. When machinery breakdowns or transportation delays interrupt the scheduled collection of funds for checks drawn against banks in the same district, the cost of the resulting float is added to overhead expenses and recovered through check collection fees.[3]

[1] Although the marginal reserve requirement for correspondent banks is twelve percent, deposits held with a correspondent are subtracted from a respondent bank's reservable liabilities. The Federal Reserve Board has argued that this subtraction effectively raises the rate of interest paid on such deposits and adjusts the rate paid on clearing balances accordingly. 49 **Federal Register** 11,251 (March 26, 1984).

[2] A very small amount of float is also created in connection with wire funds transfers and the transfer of book-entry securities. Float arising from these types of transactions can be either debit or credit float, which means that the cost to the Fed can be negative. For practical purposes, the net amount of such float is negligible.

[3] 48 **Federal Register** 10,753 (March 14, 1983).

III. EVALUATION OF THE BANK HOLDING COMPANY MODEL

Two ultimate goals underlie the pricing policy for Federal Reserve services mandated by the Monetary Control Act. The first is to give private sector firms an opportunity to offer competing services. The second is to bring about an efficient use of economic resources.

To be able to compete with the Federal Reserve, private firms must perceive an opportunity to earn a rate of return at least equal to their cost of capital.

Other types of float are charged directly to the parties receiving the resulting extension of credit. Institutions that close during midweek must pay the cost of float generated by such closings.[4] Banks receiving early credit for checks drawn against banks in other districts must pay for the resulting float.[5]

Because ACH transactions are not affected by the same factors that can delay check collection, ACH float is a smaller problem than check float. When data processing problems or network transmission delays result in the creation of ACH float, the associated costs are allocated to ACH overhead expenses and recovered through service fees. Float resulting from midweek closings is priced in much the same way as check float in corresponding cases.[6]

Financial institutions can choose among one of two payments options for float. They can either authorize the Fed to directly debit their reserve or clearing accounts for the cost of float arising from interterritorial check deposits or from midweek closings, or they can have their reserve or clearing account balances adjusted after the fact by the amount of float received over that period. These "as of" adjustments, as they are termed, reduce the amount of earnings credits paid on clearing balances or, alternatively, require holding higher required reserve balances in subsequent days to meet average reserve requirements.

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[4] Nonstandard holidays are treated differently from midweek closings, however. Nonstandard holidays are state holidays during which Federal Reserve Banks and most banks nationwide are open for business. In cases where banks are legally required to close for a state holiday, credit to the sender of an item is deferred to the next business day. 12 C.F.R. Part 210 (Regulation J, Collection of Checks and Other Items and Wire Transfer of Funds).

[5] 48 **Federal Register** 10,753 (March 14, 1983).

[6] 49 **Federal Register** 6,564 (February 22, 1984).

That opportunity can exist only if the targeted rate of return to capital incorporated into Federal Reserve service prices reflects the cost of capital faced by its potential competitors.

A pricing policy that encourages competition is also efficient from the standpoint of economic theory. The cost of capital is, by definition, the opportunity cost of capital. An opportunity cost is the cost of foregone alternatives. In a market economy decisions regarding resource allocation are based on perceptions of relevant opportunity costs. When prices reflect true opportunity costs, they give purchasers incentives to use different goods and services only so long as the value they place on those items is at least as great as the cost to society of producing them. The resulting outcome is efficient in the sense that it allocates resources to the production of goods and services most valued by market participants.

These considerations suggest that the bank holding company model can be evaluated on the basis of how well it estimates the cost of capital faced by private firms that compete with the Federal Reserve. That evaluation criterion is adopted in the following analysis.

Evaluation Criteria

Determining the appropriate targeted rate of return to capital poses a number of difficult methodological problems. These problems, however, are not unique to the Federal Reserve. Regulatory agencies such as public utility commissions have long been faced with a similar task. These agencies attempt to determine service prices that permit regulated firms to earn rates of return high enough to attract capital without yielding monopoly profits.

The pricing methodology adopted by the Federal Reserve closely resembles the rate-setting methods commonly used by regulatory agencies. Rate-setting methods for regulated industries have received a great deal of attention from economists. It seems reasonable, therefore, to apply the same evaluation standards developed to analyze public utility pricing to the methodology adopted by the Federal Reserve.

Kolbe, Read, and Hall have proposed two theoretical evaluation criteria for analyzing rate-setting methods used in public utility regulation.[6] The first is a test for consistency with economic theory. This test looks at the assumptions and procedures used to estimate the cost of capital to determine whether they are consistent with accepted economic theory. The second criterion is a test of the logical consistency of the rate-setting procedure. Its purpose is to determine whether a rate-setting procedure can be logically expected to achieve certain goals.

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[6] A. Lawrence Kolbe and James A. Read, Jr., with George R. Hall, **The Cost of Capital, Estimating the Rate of Return for Public Utilities** (Cambridge: The MIT Press, 1984), chap. 3.

Consistency with Economic Theory

Consistency with economic theory is a useful evaluation criterion because theory identifies the opportunity costs relevant to decisions affecting resource allocation. A great deal of published data, especially accounting data, measure historical costs rather than opportunity costs. Because market conditions change over time, historical cost data generally provide poor estimates of current opportunity costs. Unfortunately, exact measures of opportunity costs, such as the cost of capital, are not always available. In such cases, economic theory can be used to develop estimation methods that are free from systematic bias. Viewed from this perspective, the purpose of the test for consistency with theory is to determine whether a rate-setting procedure utilizes the best available methods to estimate true opportunity costs.

The Difference between Realized Returns and the Cost of Capital As noted earlier, the pre-tax cost of capital can be expressed as a weighted average of the expected pre-tax rate of return to equity and the interest rates paid on debt issued to finance new investment. The cost of capital differs from the realized return to capital in that it is an expected rate of return. Using the notation developed earlier, the pre-tax weighted average cost of capital can be expressed as

$$E(r) = a_1 \left[\frac{E(r_1)}{1-t}\right] + a_2 r_2 + a_3 r_3 ,$$

where now $E(r)$ denotes the expected aggregate pre-tax rate of return to capital, or cost of capital; $E(r_1)$ the expected return to equity, which measures the cost of equity; t the marginal tax rate on new investment; r_2 and r_3 the interest rates paid on long- and short-term debt issued to finance new investment; and a_1, a_2, and a_3 the targeted proportions of debt and equity used to finance new investment.

The bank holding company model uses historical returns to estimate the cost of capital. Two implicit assumptions underlie that approach. The first is that the average historical book rate of return yields good estimates of the past cost of capital to the banking industry. The second is that the historical cost of capital can be used to infer the cost of capital currently faced by its private sector competitors. Whether these assumptions are justified can be determined by examining available evidence on the behavior of capital markets.

There are a number of reasons why the cost of capital can differ from historical rates of return. First, past returns to equity can differ from the expected rate of return. Second, fluctuations in market interest rates change the cost of issuing new debt. Third, tax laws do not, as a general rule, treat different types of capital investment equally; moreover, those laws are periodically revised so that effective marginal tax rates on new investment can differ from tax rates on past investment. Finally, financing decisions, reflected by the weights a_1, a_2, and a_3, may differ at the margin for new investments. Each of these issues must be considered in evaluating different methods of estimating the cost of capital.

Estimating the Cost of Equity As residual claimants to the income earned by a firm, shareholders bear two types of risk. Business risk refers to the risk inherent to the activities a firm engages in; i.e., risk stemming from capital investment. Financial risk is created when investment is financed by borrowing. The more highly leveraged a firm is the more variable are rates of return earned by shareholders and the greater is the risk of default. Both of these sources of variability in earnings determine the risk premium demanded by shareholders. Firms that bear similar business and financial risks should, according to theory, face the same cost of equity.

The bank holding company model estimates the historical cost of equity to large holding companies by averaging past realized rates of return earned by a sample of firms. Two implicit assumptions underlie that approach. The first is that the cost of equity faced by the nation's twenty-five largest holding companies is the same. The second is that expected rates of return to equity equal subsequent realized rates on average. The last assumption is commonly made in economic research and, at least in the case of market equity returns, appears to be empirically justified.[7]

Because changes in market conditions can cause rates of return to fluctuate over time, the bank holding company model uses a three-year average of past rates of return to determine the imputed cost of equity. Basing the imputed cost of equity on a simple average of historical rates assumes that the cost of equity is constant over the sample period. The last

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[7] Studies have found that capital markets are efficient in the sense that market prices of financial assets fully incorporate all publicly available information about the firms issuing those securities. Under certain assumptions, market efficiency implies that discrepancies between realized and expected rates of return should be zero on average. See, for example, Eugene F. Fama, "Efficient Capital Markets: A Review of Theory and Empirical Work," **The Journal of Finance** 25 (May 1970): 383-417. A more recent survey can be found in Thomas E. Copeland and J. Fred Weston, **Financial Theory and Corporate Policy,** 2d ed. (Reading, Mass.: Addison-Wesley Publishing Company, 1983), chap. 10.

assumption is a strong one, but has some empirical justification. Studies have found that market rates of return for virtually all firms whose stocks trade in organized markets are uncorrelated over time. Eugene Fama has noted that such behavior is consistent with the joint hypothesis that markets are efficient, in the sense that expected rates equal realized rates on average, and that the expected rate of return to equity is constant over time.[8]

An alternative approach more commonly used to estimate the cost of equity to firms is based on the Capital Asset Pricing Model (CAPM). The Capital Asset Pricing Model specifies rates of return to risky assets as a function of their covariance with a diversified market portfolio. A principal result of that model is that only undiversifiable risk, that is, the portion of the variation in equity returns correlated with the returns to a fully diversified market portfolio, determines the risk premium demanded by shareholders. In recent years the Capital Asset Pricing Model has gained increasing acceptance in public utility rate-setting hearings.

More recently, Arbitrage Pricing Theory has begun to replace the CAPM as the dominant analytical framework used in research into capital market behavior. Arbitrage Pricing Theory is more general than the Capital Asset Pricing Model in that it relates equity returns to a number of other factors in addition to the return earned on a diversified portfolio. As with the CAPM, Arbitrage Pricing Theory can be used to estimate the cost of equity to firms. The CAPM can be viewed as a special case of Arbitrage Pricing Theory.

The above discussion has assumed that market rates of return are used to estimate the cost of equity. As noted earlier, however, the bank holding company model uses book rates of return based on accounting data. Differences between book rates of return and market rates are examined below.

Measuring Returns to Equity Market rates of return earned by shareholders are the sum of the dividend yield, the ratio of dividends to the market value of equity, and any capital gains or losses to shareholders resulting from changes in the market value of equity. Market rates of return are the theoretically correct measure of shareholder earnings. Book rates of return typically differ from market rates. Kolbe, Read, and Hall note two principal reasons for these discrepancies.

First, the market value of a firm's equity will typically differ from its book value. Although there is reason to believe that investors' expectations are correct on average, realized returns in specific cases can differ markedly from initial expectations. When a firm's earnings fall short of expectations, for example, the market value of its outstanding equity falls until the expected rate of return to equity is once again equated with the cost of equity. Thus, when market value is less than book value the book rate of return will tend to understate the true rate. Conversely, when market value exceeds book value the book rate overstates the true rate.

Second, book rates of return use accounting profits to measure the return to equity. Accounting profits may differ systematically from true economic returns, however. Standard accounting procedures typically do not recognize changes in asset values, except when assets are disposed of. Moreover, depreciation schedules used in standard accounting practices are arbitrary from an economic point of view. To the extent that accelerated depreciation schedules used for tax purposes overstate the true rate of depreciation, for example, accounting profits may understate profits. Finally, generally accepted accounting principles allow considerable discretion in the way income can be reported. It is thus theoretically possible for two firms that earn the same true incomes to report quite different accounting profits. Moreover, there is no evidence that these discrepancies will cancel out on average.[9]

It would be a straightforward task to incorporate market rates of return into the bank holding company model. Available evidence suggests that market rates would yield better estimates of the cost of capital than book rates.

The Cost of Borrowing Unlike the expected return to equity, data on market interest rates are readily available. Interest rates paid on debt contracted in the past do not reflect the cost of borrowing to finance new investment: current market interest rates do. Therefore, estimates of the cost of capital should be based on currently prevailing market interest rates.

Measuring Effective Tax Rates Tax laws stipulate both a legal or statutory tax rate and rules that specify how taxable income for a firm must be computed. Accounting conventions required by tax laws

[8] See Eugene F. Fama, **Foundations of Finance** (New York: Basic Books, Inc., 1976), chap. 5.

[9] See Kolbe, Read, and Hall, **The Cost of Capital,** pp. 47-51.

do not measure true economic costs, however. Depreciation schedules used for tax purposes, for example, rarely correspond to true economic depreciation. Consequently, effective tax rates can differ systematically from statutory rates. Effective tax rates can be either higher or lower than statutory rates, depending on whether depreciation schedules used to compute taxable income understate or overstate true depreciation.

Special tax concessions, such as the investment tax credit on purchases of new machinery and equipment, also influence effective tax rates. Investment tax credits act to lower effective marginal tax rates on income earned from such investments.

Thus, although the maximum statutory tax rate on corporate income is 46 percent, recently liberalized depreciation allowances and investment tax credits produce effective marginal tax rates on income from new investment that are much lower. A recent study by the U. S. Treasury reports estimates of effective marginal tax rates in the range of —8 to 20 percent on equipment and 40 percent on structures.[10]

The bank holding company model uses average tax rates, calculated as the ratio of taxes actually paid (with an adjustment that adds back the tax benefits banks receive from holding municipal bonds) to pre-tax profits, to estimate the effective tax rate for the holding company sample. As with the imputed cost of equity, the imputed tax rate is based on a three-year average of estimated historical tax rates for the bank holding company sample. For 1986 the imputed tax rate is 37.6 percent.[11]

While average tax rates do reflect the aggregate effects of depreciation allowances and investment tax credits on total taxes paid by firms, they do not necessarily measure effective marginal tax rates on income from new investment. Research on corporate income taxation reveals that average tax rates have systematically overstated effective marginal tax rates in recent years. An article by Alan Auerbach has analyzed the reasons for this finding.[12] Three factors discussed by Auerbach are relevant to the evaluation of the Federal Reserve's method of imputing taxes.

First, some firms may earn a rate of return to capital that is in excess of a competitive return. Such excess returns may reflect the entrepeneurial ability of management or the exercise of market power rather than a return to capital. To the extent that these excess returns do not come from depreciable capital, they face a marginal tax rate of 46 percent. Auerbach argues that the taxation of excess returns is not directly relevant to the incentives to invest in fixed capital, but is incorporated in measured average tax rates.

Second, average tax rates reflect effective tax rates on different vintages of capital. The Economic Recovery Tax Act of 1981 and the Tax Equity and Fiscal Responsibility Act of 1982 have reduced effective tax rates on income from depreciable capital below rates prevailing in the pre-1981 period. Capital acquired before these tax law changes is effectively taxed at higher rates than those applied to new capital investment. Moreover, the depreciation allowances permitted for tax purposes tend to overstate true economic depreciation. Compared to true income, taxable income is lower during the early years of an asset's life and higher in later years. As a result, effective tax rates on income from older vintages of capital tend to be higher than those on new investment. Estimates of effective tax rates based on accounting data measure the average tax rate on different vintages of capital and thus do not accurately reflect the lower effective tax rate on income from new investment. The practice of averaging estimated tax rates over time further exacerbates this problem.

The third and final point deals with asymmetries in the treatment of gains and losses. While corporate earnings are taxed at a positive rate, the tax on operating losses, which are negative earnings, is zero. Firms that operate at a loss are unable to exploit tax preference such as the investment tax credit. Thus, average tax rates overstate the effective marginal tax rate on new investment. While firms that incur losses do have limited options to carry those losses over, such options do not correct for the bias introduced by the asymmetric treatment of gains and losses.

To conclude, estimates of tax rates that are based on accounting data do not measure the effective marginal tax rate on income from new investment. The relatively higher tax rates on income from past capital investment reflected in such data represent sunk costs, which are not relevant for current investment decisions. Imputed tax rates applied to Federal

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[10] These estimates apply to equity-financed investments and assume a four percent real rate of return to equity and a five percent inflation rate. Effective tax rates for different types of equipment vary with depreciable lifetimes; effective tax rates are generally higher for assets with longer depreciable lifetimes. In addition to longer depreciable lifetimes, structures face a higher effective tax rate because they are not eligible for the investment tax credit. U. S. Treasury Department, **Tax Reform for Fairness, Simplicity, and Economic Growth,** vol. 2 (November 1984), p. 156.

[11] 50 **Federal Register** 47,627 (November 19, 1985).

[12] Alan J. Auerbach, "Corporate Taxation in the United States," **Brookings Papers on Economic Activity** 2 (1983): 451-505.

Reserve priced service operations should be set so as to reflect effective tax rates on new investment. Such a policy would be consistent with the goal of pricing in a manner that permits entry by private sector competitors.

Using Effective Marginal Tax Rates to Impute Taxes Imputed tax rates for Federal Reserve priced services could be calculated using a methodology similar to that employed in economic studies of effective corporate tax rates on U. S. industry.[13] To start, implicit user costs would have to be calculated for each type of asset. These user costs would be computed so as to reflect the present value of tax benefits, such as depreciation allowances and the investment tax credit where applicable. Total imputed financing and tax costs could then be determined by aggregating imputed earnings for each asset.

It should be noted that the procedure suggested above does not correspond to rate-setting practices employed by public utility commissions. Regulated utilities are permitted to recover actual tax liabilities incurred as a result of past tax laws. In competitive markets, however, prices are determined by prevailing opportunity costs. The cost of new investment does not depend on effective tax rates on capital purchased in the past, but on current tax laws. Rate-setting procedures that base prices on actual tax liabilities effectively protect shareholders of regulated firms from capital gains and losses resulting from changes in tax laws. Nonregulated firms, however, are not protected from such risks. The procedure outlined above would therefore be more consistent with economic theory.

Logical Consistency

The test for logical consistency attempts to determine whether a rate-setting procedure can be logically expected to attain its goals. The ultimate goals of Federal Reserve pricing are to permit private sector entry into the markets it serves and also to promote efficient resource allocation. Both of these goals are attained when the targeted rate of return to capital reflects the true cost of capital faced by private sector competitors. Therefore, the logical consistency of the Federal Reserve's rate-setting procedure can be judged by whether it can be expected to produce targeted rates of return that equal the true cost of capital on average.

The Problem of Circularity At present the Federal Reserve bases its targeted rate of return on the average historical book rate of return earned by a sample of firms it views as its principal competitors. Rates of return earned by these competitors are determined in part by the prices the Fed charges for its services, however. A recent congressional report on Federal Reserve pricing practices noted that this could lead to a potential circularity problem.[14] If targeted rates of return are set too low, as can happen when book rates of return are below market rates, correspondent bank earnings can be adversely affected by Federal Reserve pricing policy. To the extent that correspondent bank earnings are measurably affected by Fed pricing policy, subsequent targeted rates of return would be based on artificially depressed earnings that are themselves a product of the rate-setting procedure. In this case, as long as targeted rates continue to be based on book rates of return, the rate-setting procedure cannot logically be expected to target the true cost of capital.

It could be argued that the circularity problem is unimportant as a practical matter because correspondent banking services account for only a small share of revenues earned by bank holding companies. According to this argument, revenues earned from activities such as commercial lending, for example, are likely to be relatively more important than revenues from the sale of services such as check clearing (which is the principal area of competition between the Federal Reserve and commercial banks) in determining overall rates of return for the holding company sample.

This argument was acknowledged in the congressional report. That report, however, also noted that the argument calls into question the assumptions underlying the adoption of the bank holding company model. Use of the bank holding company model is predicated on the assumption that, because the largest bank holding companies are the Federal Reserve's principal competitors, the cost of capital to those firms should determine the targeted rate of return for priced services. But when a firm engages in a number of different activities its cost of capital for different investment projects will, as a general rule, differ because different projects do not carry the same risks. Thus, an estimate of the cost of capital based on overall rates of return earned by bank holding

[13] A review of these methods is contained in Alan J. Auerbach, "Taxation, Corporate Financial Policy and the Cost of Capital," **Journal of Economic Literature** 21 (September 1983): 905-40.

[14] **The Role and Activities of the Federal Reserve System in the Nation's Check Clearing and Payments System**, Report of The Subcommittee on Domestic Monetary Policy of the Committee on Banking, Finance and Urban Affairs, 98 Cong. 2d sess., pp. 41-43.

companies might not reflect the cost of capital for payments services even if the bank holding company sample does include the Federal Reserve's major competitors. Implicitly, then, the bank holding company model assumes that the cost of capital for investment projects related to payments services is the same as the average cost of capital faced by large bank holding companies. This is a strong assumption, and one that is difficult to either prove or disprove. It is worth noting, however, that bank holding companies are not the Fed's only competitors. In the market for automated clearinghouse services, for example, a nonbanking firm has recently begun to compete with the Fed.

A Suggested Alternative Procedure Problems with circularity are not unique to Federal Reserve pricing. They are also encountered with rate-setting procedures commonly employed by public utility commissions. Indeed, the pricing methodology adopted by the Federal Reserve is based on such commonly used procedures. The problem of circularity is therefore a familiar one to regulatory economists.

As an alternative to the bank holding company model, the congressional report cited earlier suggested using the Capital Asset Pricing Model in conjunction with data on market rates of return for a broad-based sample of U. S. industry. The proposed methodology outlined in the report is one that has gained increasing acceptance among public utility commissions in recent years.[15]

Adoption of a broad-based sample of U. S. industry was suggested as a means of dealing with the potential problem of circularity. Firms included in this larger sample should ideally bear risks that are comparable to those facing suppliers of correspondent banking services. To some extent, the CAPM could be used to adjust for differences in financial risk across the sample.

Using market rates of return could help mitigate any potential problems with circularity because market forces cause equity prices to adjust until the expected return to equity and the cost of equity are equated. Thus, to the extent that Federal Reserve pricing policy does affect correspondent bank earnings, subsequent realized rates would not deviate systematically from expected rates as book rates of return would.

[15] It is also the methodology that appears to be favored by regulatory economists. See, for example, Kolbe, Read, and Hall, **The Cost of Capital,** chap. 3.

These suggestions appear to offer a means of improving the current procedure. However, the proposed methodology is not without its own shortcomings. First, the CAPM has itself been subject to criticism on theoretical grounds because it assumes that the covariance of returns with the market portfolio is the only factor determining the risk premium expected by shareholders. As noted earlier, Arbitrage Pricing Theory is not subject to the same criticisms.

Second, adoption of the method described above would also require the Fed to resolve a number of difficult problems not normally encountered in other types of rate-setting procedures. The weighted-average cost of capital depends not only on the cost of equity finance, but also on the cost of issuing debt and the overall financial structure. In determining allowable rates of return for privately owned public utilities, the firm's financial structure need not be assumed or imputed. The amount of outstanding debt, the interest rates paid on that debt, and the debt-equity ratio are all given.

In contrast, estimating the appropriate cost of equity finance for the Federal Reserve is only the first step in determining the overall imputed cost of capital. If bank holding companies are not used as a model of financial structure, then some other model must be adopted. A more appropriate model is not immediately evident, however. Finally, because the financial structure of banks tends to differ from that of other types of firms, it could prove difficult to select a sample of firms from other industries that bear comparable business and financial risks. For the present, these latter issues remain unresolved.

IV. COST ALLOCATION

As the nation's central bank, the Federal Reserve System bears responsibility for discharging a variety of tasks. Fed services are grouped into four general categories: (1) Monetary Policy, (2) Supervision and Regulation, (3) Treasury, and (4) Financial Institutions and the Public. Monetary policy can be characterized as a nonexcludable public good, and would therefore be difficult to price explicitly since everyone benefits whether they pay or not. Bank supervision has some attributes of a public good, although the Federal Reserve is the only federal bank regulatory agency that does not charge for examinations. Treasury, or fiscal agency functions, are not priced because the Federal Reserve routinely turns over all surplus revenues to the Treasury. Correspondent banking and payments services fall into the

fourth category. The Monetary Control Act requires these services to be priced.[16] Pricing is feasible for these services because they have the characteristics of private goods.

Because not all services are priced, costs attributable to priced services must be identified and separated from other costs. Sales of priced services vary among Reserve Banks, so individual cost recovery targets must be set for each Bank. Finally, separate cost recovery targets must be set for each individual priced service line.

The Private Sector Adjustment Factor

Operating expenses are allocated to different services using a cost accounting system known as PACS (Planning and Control System). PACS also determines the value of capital assets devoted to priced services. (See insert for more details.) Capital financing costs and other imputed private sector costs are distributed to the different priced service lines using a uniform mark-up over operating expenses known as the Private Sector Adjustment Factor (PSAF).

As a first step in calculating the PSAF, total capital financing costs are determined using (1) the estimated financial cost of capital from the bank holding company model, and (2) the value of the priced services asset base obtained from the PACS accounting system. If the variable r represents the imputed pre-tax cost of capital and K the value of the asset base, then total imputed capital and corporate income tax costs, denoted by the variable CC, are given by:

$$CC = rK.$$

Other PSAF adjustments include allowances for sales taxes, federal deposit insurance assessments, and a portion of expenses incurred by the staff of the Board of Governors. Strictly speaking, these imputed costs should be classified as operating expenses. However, the PSAF cost allocation procedure groups them together with imputed capital and income tax costs. For purposes of this discussion, therefore, the variable CC should be regarded as representing capital costs plus the other imputed private sector costs mentioned above.

[16] The fourth category also includes a number of services that are not priced. The basic service lines subject to the pricing requirements of the Monetary Control Act are: (1) currency and coin services, (2) check clearing and collection services, (3) wire transfer services, (4) automated clearinghouse services, (5) settlement services, (6) securities and safekeeping services, (7) float, and any new services the Federal Reserve offers.

Cost Accounting Methods

The Federal Reserve's Planning and Control System (PACS) was designed initially as a budget expense and control system, but was modified to serve as a cost accounting system capable of meeting the requirements of pricing. PACS performs three basic tasks. First, it identifies all direct expenses incurred as a result of separate activities. Second, it allocates overhead expenses to different service lines. Third, it allocates capital assets to different services so that imputed capital financing costs can be determined.

Identifying the direct expenses incurred in producing different services is, at least in principle, a straightforward task, and one that PACS was originally designed to perform. Like other cost accounting systems, PACS allocates direct expenses, such as wages and salaries, to different services.

Allocating indirect, or overhead, expenses poses a more difficult problem. Examples of overhead activities include Bank administration, personnel administration (including recruiting and placement and wage and salary administration), and protection (security services). PACS uses estimates of the proportion of overhead expenses attributable to each activity to allocate overhead expenses. For example, costs associated with personnel administration are allocated according to the ratio of personnel employed by each service, while cost allocations for Bank administration are determined by the ratio of direct expenses incurred by different priced services. Expenses arising from security services, on the other hand, are allocated according to a survey of the percentage of manhours devoted to protection of valuables.

The priced services asset base is determined using a direct determination method that allocates all single purpose assets directly to the activity employing them. Some capital assets, termed joint-purpose assets, are used for a variety of different purposes. A good example of a joint purpose asset would be a Federal Reserve Bank building, which typically houses all activities performed by the Bank. Joint-purpose assets are allocated to different services in much the same way as overhead expenses; that is, based on estimates of usage. Assets used in overhead activities are allocated to individual services based on overhead expense allocation ratios.

The PSAF procedure groups direct operating expenses together with overhead expenses measured and calculated by PACS. Let the variable OE represent total operating expenses, including noncapital overhead expenses, allocated to priced services. The PSAF mark-up is the ratio of imputed private-sector costs to all other operating expenses:

$$\text{PSAF} = \frac{\text{CC}}{\text{OE}}$$

Notice that multiplying this ratio by total operating expenses, OE, would just recover total imputed costs.

In calculating the PSAF, aggregate cost data for all the Federal Reserve Banks and all priced services are used. The resulting mark-up is applied uniformly to all services offered by Reserve Banks to arrive at separate cost recovery targets. To see how the procedure works, let OE_{ij} denote total expenses allocated to activity i (where activity i represents a particular priced service) at bank j. Then, total private sector expenses imputed to that activity are determined by the product PSAF x OE_{ij}.

For services such as check clearing, for which prices may vary by region, separate cost recovery targets are determined for each Reserve Bank. Other services such as electronic funds transfer have prices set uniformly on a nationwide basis. Cost recovery targets for those services are determined on the basis of aggregate systemwide costs incurred in producing the service, calculated by summing service costs across all Reserve Banks.

Notice that the PSAF cost allocation procedure is not intended to recover "overhead" expenses in the sense that that term is usually understood. The Fed's accounting conventions group overhead expenses other than capital costs together with other routine operating expenses in the variable OE. In contrast, the overhead mark-ups used by private-sector firms typically include all indirect overhead expenses (such as the cost of personnel management services) together with capital financing costs in the numerator of the mark-up ratio. The PSAF ratio is often mistakenly interpreted as representing such a mark-up. It should be clear from the preceding discussion that this is not the case.

Allocation of Imputed Costs

Now consider the effects of this allocation procedure on individual cost recovery targets. Notice that the imputed cost allocation to service i at bank j can be equivalently stated as:

$$\text{PSAF} \times \text{OE}_{ij} = \left(\frac{\text{OE}_{ij}}{\text{OE}}\right) \times \text{CC},$$

where:

$$\sum_i \sum_j \frac{\text{OE}_{ij}}{\text{OE}} = 1.$$

The ratio (OE_{ij}/OE) represents the share of the total direct expenses incurred by Reserve Bank j in providing some projected amount of service i. From the above expression it is evident that using the same systemwide PSAF to impute capital and tax costs to separate activities amounts to weighting total imputed costs by the ratio of expenses incurred in providing service i at bank j to expenses for the system as a whole. Consequently, those services that are relatively costly to provide in terms of noncapital expenditures are also allocated a relatively larger share of capital and other imputed private sector costs. Similarly, regional Reserve Banks having relatively high noncapital costs in relation to other Reserve Banks are required to bear a relatively larger share of imputed private sector costs. The resulting cost allocation may or may not accurately reflect true underlying costs.

V. EVALUATION OF THE PSAF COST ALLOCATION METHOD

Like the bank holding company model, the PSAF cost allocation method resembles rate-setting methods commonly used in public utility regulation. These methods are reviewed and evaluated below and the analysis is applied to the PSAF methodology.

Fully Distributed Cost Pricing Methods

Fully distributed cost pricing refers to a variety of average cost pricing methods. Under this type of pricing, total projected revenue requirements are fully distributed on a per-unit cost basis and prices are set so as to satisfy those requirements. Such pricing methods are commonly used in public utility rate-setting proceedings to allocate targeted capital cost recoveries and other joint production costs to different types of services.[17] The PSAF mark-up used by the Federal Reserve is an example of fully distributed cost pricing.

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[17] For a more complete description of different fully distributed cost pricing methods used in public utility regulation, see Alfred E. Kahn, **The Economics of Regulation: Principles and Institutions,** vol. 1 (New York: John Wiley and Sons, Inc., 1970), pp. 150-58.

One reason for the widespread use of fully distributed cost pricing methods lies with their relative simplicity. A second reason for the popularity of these methods stems from the widespread perception that they allocate costs fairly. By definition, fully distributed cost pricing imposes equal mark-ups on all services. It thus avoids the appearance of discriminatory treatment of different classes of customers.

Evaluation of Fully Distributed Cost Pricing Methods

Prices perform the task of allocating resources in a market economy. Economists therefore evaluate different pricing methods according to whether resource allocations resulting from those methods are efficient. In addition to economic efficiency, policymakers are also concerned with the issue of equity. Discriminatory pricing policies are prohibited under existing antitrust laws. The analysis that follows evaluates fully distributed cost pricing methods according to the criteria of efficiency and equity.

Economic Efficiency As a general rule economic theory finds that efficient resource allocation is attained when prices are set so as to reflect underlying marginal costs. Marginal costs measure the opportunity cost of the resources used to produce different goods and services. Efficient resource allocation requires that the ratio of prices charged for different goods and services equal the corresponding ratio of marginal costs, or that prices be proportional to marginal costs. When these conditions are satisfied, prices charged for different goods and services reflect the true cost to society of producing those items. From an operational standpoint, then, different pricing methods can be evaluated using departures from marginal costs as a guide to losses in economic efficiency.[18]

A special case arises when production is subject to economies of scale. This is typically the case for public utilities. Certain services produced by the Fed also appear to be subject to economies of scale.[19] When scale economies exist, marginal costs are below average costs so that strict marginal cost pricing will not recover total costs. In this case, efficient resource allocation is attained by setting prices in inverse proportion to demand elasticities.[20] A second-best solution involves either two-part pricing (e.g., an access charge plus a per-unit service fee reflecting marginal costs), or setting prices proportional to marginal costs so that total costs can be recovered while leaving price ratios equal to ratios of marginal costs.

For firms that produce a single output the last method amounts to average cost pricing. When a firm produces more than one output, however, production may involve joint costs. Joint costs exist when the same productive inputs are used to produce more than one type of output; for example, Reserve Bank buildings in the case of the Fed. When production is subject to joint costs, marginal costs are determined according to causal responsibility. The marginal cost of a good or service is the cost that could be avoided if the last unit of output were not produced, holding production of all other outputs fixed.

Unfortunately, marginal costs may be difficult to determine when production relies on joint inputs. For this reason, fully distributed cost allocation methods are often used to allocate joint production costs. In general, fully distributed cost allocations differ from marginal costs. But because marginal costs can be difficult to measure, precise measures of efficiency losses resulting from the use of fully distributed cost allocation methods are difficult to determine. Indeed, the cost of implementing true marginal cost pricing can exceed the economic value of efficiency gains resulting from such a policy. Thus, total economic costs may be lower under fully distributed cost pricing than under marginal cost pricing. This could occur if, for example, departures of fully distributed costs from marginal costs are small while the added cost of implementing marginal cost pricing is large.

Arguments such as the one above are frequently made to justify the use of fully distributed cost pricing methods. Unless some attempt to measure marginal costs is made, however, there may be no way to judge whether these methods really are relatively efficient.

Equity Price discrimination occurs when price differentials do not reflect differences in the underlying cost of selling to different purchasers. By

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[18] This is the approach taken by Kahn, **The Economics of Regulation**, in his analysis of fully distributed cost pricing methods.

[19] See David B. Humphrey, "Costs, Scale Economies, Competition, and the Product Mix in the U. S. Payments Mechanism," Staff Studies 115 (Board of Governors of the Federal Reserve System, 1982).

[20] For a more complete discussion of efficient pricing see William J. Baumol and David E. Bradford, "Optimal Departures from Marginal Cost Pricing," **American Economic Review** 60 (June 1970): 265-83.

definition, then, marginal cost pricing is not discriminatory.[21] As noted by Alfred Kahn, "It is fair, as a general rule, to impose costs on people when and to the extent that they impose costs on society."[22]

Antitrust laws generally permit firms to charge price differentials when those differentials are based on differences in cost. Marginal cost pricing is therefore permissible under those laws. In view of the above considerations, marginal costs can be used as a standard to evaluate the fairness of different pricing methods in cases where marginal cost pricing is feasible.

Although fully distributed cost pricing methods are generally viewed as being fair, economic theory would classify them as discriminatory to the extent that the resulting prices depart from marginal costs. Imposing equal mark-ups may appear to be fair, but it does not always insure that purchasers pay the true cost of the goods and services received. The perception that fully distributed cost pricing methods are equitable continues to enjoy widespread, if misguided, acceptance, however, and such pricing practices have not been found to violate antitrust laws.

An Evaluation of Federal Reserve Pricing Practices

The preceding discussion suggests that fully distributed cost pricing methods can produce outcomes that are less than ideal from the standpoint of economic theory. In the case of Fed pricing policy, however, the existence of competition provides an independent check of cost allocation practices and mitigates the distortionary effects of inappropriate pricing decisions when they occur.

Economic theory predicts that firms operating in purely competitive markets will price according to marginal costs. Under these conditions the issues of efficiency and equity are resolved by the market. In contrast, competition is restricted in regulated markets such as those served by public utilities so that regulatory agencies take the place of the market in determining prices. Rate-setting methods used by those agencies are shaped by the goals of efficiency and equity, but the definition of equitable pricing behind the adoption of those methods do not always agree with the economist's notion of that term.

Debate over appropriate standards of equity and efficiency that should guide Fed pricing policy is a less contentious issue because the Fed must compete with private sector suppliers. As long as aggregate imputed costs are estimated correctly, an inappropriate allocation of costs between different service lines would result in some services becoming relatively overpriced while others are underpriced. If that happened, the Fed would find it difficult to retain market share for those services that are relatively overpriced, thus making it difficult to continue indirectly subsidizing relatively underpriced services. Thus, the presence of competition makes it difficult for the Fed to adhere to a pricing policy that might otherwise result in inefficient resource allocation or unequitable treatment of certain customers.

Market-Sensitive Pricing In response to market forces and to minimize the distortionary effects of fully distributed cost pricing the Fed has instituted market-sensitive pricing for individual services within a service line. While overall cost recovery targets for broadly defined service lines, such as commercial check clearing and ACH, are partly determined by the PSAF mark-up, prices for individual services comprising those service lines are set in response to market forces. Market-sensitive pricing is efficient to the extent that the PSAF mark-up allocates total imputed capital costs to each service line appropriately.

A feasible alternative to the current practice of allocating costs using a uniform mark-up would be to set targeted cost recoveries based directly on capital assets allocated to each service line by the PACS accounting system, in effect creating a separate mark-up, or PSAF, for different service lines. The resulting cost allocation should more closely approximate true marginal costs.

Imputed Deposit Insurance Costs There is at least one other area, namely imputed deposit insurance expenses, where marginal cost pricing principles could be applied to Fed pricing. At present, these expenses are allocated together with imputed capital costs using the PSAF mark-up. Since they are determined by the level of clearing balances held with Reserve Banks, it would seem more appropriate to charge imputed deposit insurance costs against the profits earned on clearing balances. This would probably require a downward adjustment to the interest rate paid on clearing balances.

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[21] For a more detailed discussion of price discrimination, see F. M. Scherer, **Industrial Market Structure and Economic Performance** 2d ed. (Boston: Houghton Mifflin Company, 1980), chap. 21.

[22] Alfred E. Kahn, "The Road to More Intelligent Telephone Pricing," **Yale Journal of Regulation** 1 (1984): 146.

VI. SUMMARY AND CONCLUSIONS

Because the Federal Reserve is a nonprofit institution, its cost of capital is not determined in capital markets as is the case with purely private, profit-making firms. Nevertheless, the Monetary Control Act requires the Fed to earn a return to capital comparable to that earned by private firms. Consequently, the Fed is faced with the task of determining an appropriate rate of return to capital for its priced services.

A similar problem arises in connection with public utility regulation. While most utilities are privately owned, their return to capital is determined by regulatory fiat rather than by market forces. Given the similarity between public utility and Federal Reserve pricing, it should not be surprising that the Fed's pricing methodology is patterned after rate-setting methods developed for public utility regulation.

Rate-setting methods for regulated industries have received a great deal of attention from economists. Research on this topic has dealt with the problems of identifying appropriate operational goals and developing methods of evaluating different rate-setting procedures. Although problems encountered in public utility regulation are not identical in all respects to those connected with Federal Reserve pricing, some of the methods developed to analyze such rate-setting procedures can be used to evaluate Federal Reserve pricing methods. The analytical framework developed in this article represents a first step toward that goal.

Highlights

Earnings and Capital Accounts

Net earnings before payments to the United States Treasury increased in 1985 by $170,052,685.71 to $1,497,050,099.02. Six percent statutory dividends amounting to $5,149,817.38 were paid to Fifth District member banks, and the sum of $1,481,448,481.64 was turned over to the United States Treasury.

Capital stock rose by $10,451,800 to $90,812,250 as member banks increased their shareholdings in this Bank, as required by law, to reflect the rise in their own capital and surplus accounts. The Bank's surplus account increased $10,451,800 to $90,812,250.

Discount Rate

On May 20 the discount rate was reduced from 8 percent to 7½ percent. This action was taken against the background of a relatively flat level of industrial activity reflecting the impact of rising imports and a strong dollar. On October 11 the directors of the Richmond Bank, with the approval of the Board of Governors, established a flexible rate for extended credit. For the year as a whole, the volume of activity in the Discount and Credit Department increased substantially above its level of the previous year largely as a result of borrowings by nonfederally insured savings and loan associations in Maryland and North Carolina.

Examining

Beginning in March the Examining Department became involved in the emerging savings and loan crises in the states of Ohio, Maryland, and North Carolina. Initially, examiners assisted the Federal Reserve Bank of Cleveland in responding to the Ohio crisis. Later, after facilities of the discount window had been made available to nonfederally insured institutions in Maryland and at the request of the state supervisory authorities, department personnel conducted examinations of certain Maryland state savings and loans starting in April. Subsequently, they coordinated the examinations of institutions in Maryland and assisted in North Carolina in connection with the filing of applications for deposit insurance with the Federal Savings and Loan Insurance Corporation. Three Maryland institutions were acquired by Chase Manhattan Corporation and were converted to a single member state bank effective November 1.

On October 7, the Board of Governors of the Federal Reserve System adopted a revised schedule for the frequency and scope of examinations of State member banks and the inspections of bank holding companies. These guidelines generally increase the frequency of examination of the larger institutions and those exhibiting problems. The revised schedule, which calls for an annual examination of all institutions, became effective January 1, 1986.

Technological Innovations

In 1985 the Richmond Office began participating in a pilot project to determine the feasibility of *check truncation,* a process in which vital information captured from the magnetic encoding of checks is transmitted to paying banks electronically rather than through the physical movement of checks themselves. The year also saw the application of new technology to the handling of cash orders and the detection of unfit currency. To facilitate the processing of cash orders received by telephone, the Bank installed an automated telephone answering service linked to a computer. Financial institutions having access to this system need only transmit their orders by touch-tone telephone, with the computer automatically processing this information, preparing the necessary documents, and charging the ordering institution's account. Another technological advance occurred during the year with the installation of improved sensors to better detect unfit currency. Besides improving the overall quality of currency outstanding and thus providing depository financial institutions with bills acceptable for use in automated teller machines (ATM), this new equipment includes enhanced counterfeit detection capabilities.

A key component of the new payments technology deployed by the Bank in 1985 was the Fed Online Xchange (FOX), which started in October 1984 with a pilot program for four participating District institutions. Via FOX, depository institutions can obtain electronic access to Fed services and information through microcomputers linked to the Bank's computer. This connection allows banks to send and receive funds transfers, to originate and receive ACH transactions, and to obtain accounting information and other useful services electronically. FOX provides substantial price reduction since the automated on-line transaction fees are significantly lower than those for off-line services. Eighty-six institutions

came on line to the Fifth District Communications System in 1985. Three on-line institutions merged with other on-line institutions during the year, bringing the net total to 208.

Another service initiated in 1985 came as a result of a change in Regulation J requiring paying institutions to notify the institution of first deposit of their intention to dishonor any check over $2,500. Using the Bank's new service, returning institutions electing not to provide such notification directly may instead do so indirectly either through the Bank's on-line network, or by having the Bank initiate the return notice for them by telephone.

Consistent with the Federal Reserve's Long Range Automation Plan, new software systems for securities transfers and ACH processing were installed in 1985 and plans were made for the installation of a new funds transfer system in early 1986. In addition, ACH processing and safekeeping of definitive securities were consolidated in the Richmond Office during 1985 to achieve greater efficiency in operations.

Community Affairs and Economic Information

In executing the Bank's function of informing lenders and community organizations about the Community Reinvestment Act, the Community Affairs Office sponsored two conferences in Richmond on neighborhood reinvestment. In addition, a conference entitled "Community Redevelopment for the Carolinas" was sponsored by the Charlotte Office.

Several new publications were developed and distributed as a part of the Bank's economic information program. These publications included consumer-type brochures and a 30-page booklet entitled "Homeownership."

Following recommendations from the Board of Governors, this Bank established a Small Business and Agriculture Advisory Council to improve communications with small businesses, as well as agricultural and other groups.

New Building - Charlotte

The conceptual design of the new building was completed in September. There will be three floors and a full basement, encompassing 265,000 gross square feet. Gilbane Building Company was selected in October as the preconstruction consultant.

Baltimore Office

The most significant development at the Baltimore Office involved the Savings and Loan crisis in Maryland. Following a similar occurrence in Ohio earlier in the year, a run on several privately-insured S&Ls in May led to the closing of some institutions and to deposit-withdrawal limitations on all others. At the request of the Governor of Maryland, approximately 300 examiners from all the federal bank and thrift supervisory agencies participated in emergency examinations of over 100 institutions. The Baltimore Office provided logistical support to this extraordinary effort. In addition, virtually all of its departments were involved in dealing with the operational problems resulting from the crisis.

During 1985 the Baltimore Office participated in a System project to develop and test second generation automated currency processing systems. A prototype from the firm of Giesecke and Devrient of Germany was delivered to the Baltimore Office in June. By the end of the year, accountability tests had been completed and throughput and sustained-production tests had begun. In addition to testing all aspects of the G&D prototype system, the Baltimore staff is responsible for the development of ergonomics standards and test plans for all three prototypes being tested by the System. The entire project is under the general direction of the staff of the Culpeper Facility.

The Baltimore Office agreed to participate in a Partnership Program between Baltimore City schools and the business community. This program, sponsored by the Greater Baltimore Committee, involves the "adoption" of city schools by local businesses who will provide various kinds of nonfinancial support and assistance. Under the program the Baltimore Office will be paired with Carver Vocational Technical School.

Culpeper Office

In 1985 the Culpeper Office completed the factory development of three prototype Second Generation High Speed Currency Handling Systems, which are now undergoing site testing at Baltimore and two other Federal Reserve Offices. Other key projects completed during the year included (1) the installation of advanced currency fitness and denomination detectors in all Federal Reserve Banks, (2) the successful testing of a covert anticounterfeiting system, and (3) the installation of a new anticounterfeiting laboratory in Culpeper.

Federal Reserve Membership

The following newly chartered institutions in the Fifth District opened for business during 1985 as members of the Federal Reserve System:

National Banks

Bay National Bank Annapolis, Maryland	April 1
Summerville National Bank Summerville, South Carolina	May 20
Hilton Head Bank & Trust Company, N.A. Hilton Head Island, South Carolina	June 17
One Valley National Bank of Hurricane Hurricane, West Virginia	September 23
Bank 2000, National Association McLean, Virginia	October 18

State Banks

Peoples Bank of Virginia Chesterfield County, Virginia	January 28
Hallmark Bank and Trust Company of Virginia Springfield, Virginia	February 4
Highlands Union Bank Abingdon, Virginia	April 27
The Bank of Tidewater Virginia Beach, Virginia	July 8
Fairfax Bank and Trust Company Fairfax, Virginia	July 22
Princess Anne Commercial Bank Virginia Beach, Virginia	August 26
South Boston Bank South Boston, Virginia	October 11
Chase Bank of Maryland Baltimore, Maryland	November 1

The following nonmember bank converted to membership in the Federal Reserve System during 1985:

Albemarle Bank and Trust Company Charlottesville, Virginia	November 1

Changes in Directors

The Board of Governors of the Federal Reserve System made three appointments to fill vacancies that were created during 1985. In June, Hanne Merriman, President, Garfinckel's, Washington, D. C., was appointed as a Class C director on the Richmond Board to succeed William S. Lee, Chairman of the Board and Chief Executive Officer, Duke Power Company, Charlotte, North Carolina, whose term expired December 31, 1984. Gloria L. Johnson, President Hutzler Brothers Company, Baltimore, Maryland, was named in September to fill the vacancy created on the Baltimore Board by the resignation of Thomas H. Maddux of Baltimore, Maryland. In October, James E. Bostic, Jr., Division General Manager, Convenience Products Division, Georgia-Pacific Corporation, Aiken, South Carolina, was appointed to fill the vacancy created on the Charlotte Board by the resignation of Robert L. Albright, President, Johnson C. Smith University, Charlotte, North Carolina.

The election, by Fifth District member banks, of one Class A and one Class B director to three-year terms on the Richmond Board of Directors was held in the fall. K. Donald Menefee, Chairman of the Board & Chief Executive Officer, Madison National Bank, and Chairman of the Board & President, James Madison Limited, Washington, D. C., was elected a Class A director by banks in Group 2 to succeed Willard H. Derrick, President and Chief Executive Officer, Sandy Spring National Bank and Savings Institution, Sandy Spring, Maryland, whose term expired at the end of 1985. Edward H. Covell, President, The Covell Company, Easton, Maryland, was elected by banks in Group 3 as a Class B director to succeed George Dean Johnson, Jr., Partner, Johnson, Smith, Hibbard, Cleveland, Wildman and Dennis, Spartanburg, South Carolina, whose term expired December 31, 1985.

The Richmond Board of Directors appointed H. Grant Hathaway, Chairman of the Board, Equitable Bank, N.A., Baltimore, Maryland, to a three-year term on the Baltimore Board. He succeeded Hugh D. Shires, Senior Vice President (Retired), The First National Bank of Maryland, Cumberland, Maryland, whose term expired at the end of 1985. The Board of Directors also appointed Joseph W. Mosmiller, Chairman of the Board, Loyola Federal Savings and Loan Association, Baltimore, Maryland, to a three-year term to succeed Howard I. Scaggs, Chairman of the Board, American National Building and Loan Association, Baltimore, Maryland, whose term expired December 31, 1985. Reappointed to the Charlotte Board for three-year terms were J. Donald Collier, President and Chief Executive Officer, First National Bank, Orangeburg, South Carolina, and James G. Lindley, Chairman, South Carolina National Corporation, and Chairman and President, The South Carolina National Bank, Columbia, South Carolina.

The Board of Governors redesignated Leroy T. Canoles, Jr., President, Kaufman & Canoles, Norfolk, Virginia, as Chairman of the Richmond Board for 1986. Robert A. Georgine, President, Building & Construction Trades Department, AFL-CIO, Washington, D. C., was reappointed to a three-year term as Class C director and renamed Deputy Chairman of the Board for 1986.

Thomas R. Shelton, President and Chief Operating Officer, Perdue Farms, Incorporated, Salisbury, Maryland, was appointed by the Board of Governors to a three-year term on the Baltimore Board, effective January 1, 1986. Mr. Shelton succeeded Edward H. Covell, President, The Covell Company, Easton, Maryland, whose term expired December 31, 1985. Reappointed to the Charlotte Board for a three-year term was G. Alex Bernhardt, President, Bernhardt Industries, Inc., Lenoir, North Carolina.

Robert L. Tate, Chairman, Tate Industries, Baltimore, Maryland, was reelected Chairman of the Baltimore Board for 1986; similarly, Wallace J. Jorgenson, President, Jefferson-Pilot Communications Company, Charlotte, North Carolina, was reelected Chairman of the Charlotte Board.

Federal Advisory Council

John G. Medlin, Jr., Chief Executive Officer of First Wachovia Corporation, The Wachovia Corporation, and Wachovia Bank and Trust Company, N.A., Winston-Salem, North Carolina, was reappointed by the Richmond Board of Directors as the Fifth Federal Reserve District representative to the Federal Advisory Council for a one-year term, beginning January 1, 1986. The twelve-member Council, consisting of one member from each of the Federal Reserve Districts, meets in Washington at least four times a year with the Board of Governors of the Federal Reserve System to discuss business conditions and other topics of current interest.

Changes in Official Staff

John F. Rand, Senior Vice President, elected to take early retirement on March 1 after 18 years of service in the Federal Reserve System. Also on March 1 James D. Reese was promoted to Senior Vice President in charge of the Bank's Computer Planning, Data Processing, Computer Services, Budget & Control, and Accounting Departments; R. Wayne Stancil was promoted to Vice President; and Edgar A. Martindale III, was transferred from the Baltimore Office and promoted to Budget & Control Officer.

On April 1 James Parthemos, Senior Vice President and Director of Research, retired after nearly 25 years of service and J. Alfred Broaddus, Jr., was promoted to assume his position.

Victor Turyn, Vice President at the Baltimore Office, retired May 1. On June 1 Samuel W. Powell, Jr., was promoted to Vice President and transferred from the Baltimore Office to the Charlotte Office. Walter A. Varvel rejoined the Richmond Bank as Vice President on June 10 after a period in private business.

In December the following promotions were announced to be effective January 1, 1986: at the Richmond Office, J. Lander Allin, Jr., to Vice President, Sharon M. Haley to Assistant Vice President and Secretary, Michael W. Newton to Assistant Vice President, Marsha S. Shuler to Planning Officer, and Arthur J. Zohab, Jr., to Examining Officer; at the Culpeper Office, James J. Florin III, was promoted to Assistant Vice President.

Summary of Operations

	1985	1984
Currency Received and Verified		
Number of pieces	1,493,878,000	1,402,212,000
Dollar amount	18,443,144,000	16,836,022,000
Currency Verified and Destroyed		
Number of pieces	584,642,000	625,251,000
Dollar amount	4,772,150,000	4,042,321,000
Coin Received and Verified		
Number of coin	3,180,273,000	2,742,393,000
Dollar amount	482,417,000	419,261,000
Checks Handled		
U. S. Government checks		
Number	73,728,000	74,340,000
Dollar amount	98,009,834,000	111,901,353,000
Postal money orders		
Number	0	3,192,000
Dollar amount	0	186,835,000
Commercial checks - processed*		
Number	1,245,489,000	1,143,489,000
Dollar amount	799,120,000,000	747,485,926,000
Commercial checks - packaged items		
Number	211,007,000	224,257,000
Dollar amount	83,689,000,000	106,557,000,000
Collections Items Handled		
U. S. Government coupons paid		
Number	105,000	145,000
Dollar amount	72,402,000	92,083,000
Noncash items		
Number	189,545	170,346
Dollar amount	644,147,000	632,599,000
Fiscal Agency Activities		
Issues, Redemptions, and Exchanges of U. S. Securities:		
Definitive securities		
Number	10,638,061	10,818,007
Dollar amount	2,413,574,000	2,545,848,000
Book-entry		
Number	368,384	405,300
Dollar amount	1,738,116,790,000	1,466,063,917,000
Transfer of Funds		
Number of transfers sent and received	3,943,306	3,652,603
Dollar amount	5,628,266,000,000	4,390,377,000,000
Food Stamps Redeemed		
Number	205,813,000	218,860,000
Dollar amount	967,420,000	890,126,000
Loans		
Number	5,092	2,974
Dollar amount	67,182,000,000	16,557,514,751

* Excluding checks on this Bank.

Comparative Financial Statements

Condition

Assets:	December 31, 1985	December 31, 1984
Gold certificate account	$ 969,000,000.00	$ 969,000,000.00
Special Drawing Rights certificate account	426,000,000.00	408,000,000.00
Coin	87,663,649.34	61,324,351.31
LOANS AND SECURITIES:		
Loans to depository institutions	311,745,000.00	234,493,417.00
Federal agency obligations	725,662,782.59	699,180,268.37
U. S. Government securities:		
Bills	7,534,528,048.83	5,920,203,669.83
Notes	5,966,450,406.43	5,436,946,614.24
Bonds	2,180,873,924.34	1,912,771,201.03
TOTAL U. S. GOVERNMENT SECURITIES	15,681,852,379.60	13,269,921,485.10
TOTAL LOANS AND SECURITIES	16,719,260,162.19	14,203,595,170.47
Cash items in process of collection	681,695,788.24	234,334,200.09
Bank premises	100,993,015.39	103,225,985.39
Furniture and equipment, net	22,589,074.49	19,838,990.76
Other assets	683,940,654.20	445,768,085.87
Interdistrict settlement account	(417,951,273.08)	1,103,512,999.83
Accrued service income	4,522,504.70	4,350,028.78
TOTAL ASSETS	$19,277,713,575.47	$17,552,949,812.50
Liabilities:		
Federal Reserve notes	$16,656,317,470.00	$15,427,571,917.00
DEPOSITS:		
Depository institutions	1,584,058,678.17	1,412,523,730.02
Foreign	7,350,000.00	7,650,000.00
Other	68,328,253.13	63,288,240.79
TOTAL DEPOSITS	1,659,736,931.30	1,483,461,970.81
Deferred availability cash items	584,406,946.91	265,330,317.19
Other liabilities	195,627,727.26	215,864,707.50
TOTAL LIABILITIES	19,096,089,075.47	17,392,228,912.50
Capital Accounts:		
Capital paid in	90,812,250.00	80,360,450.00
Surplus	90,812,250.00	80,360,450.00
TOTAL LIABILITIES AND CAPITAL ACCOUNTS	$19,277,713,575.47	$17,552,949,812.50

Earnings and Expenses

	1985	1984
EARNINGS:		
Loans to depository institutions	$ 22,552,116.45	$ 8,647,599.16
Interest on U. S. Government securities	1,454,471,377.59	1,382,870,087.20
Foreign currencies	11,173,961.86	11,123,151.70
Income from services	50,116,744.11	47,747,216.12
Other earnings	756,264.70	597,344.85
TOTAL CURRENT EARNINGS	1,539,070,464.71	1,450,985,399.03
EXPENSES:		
Operating expenses (including depreciation on bank premises) after deducting reimbursements received for certain Fiscal Agency and other expenses	81,441,737.44	75,867,077.28
Cost of earnings credits	8,117,290.53	10,051,639.60
NET EXPENSES	89,559,027.97	85,918,716.88
CURRENT NET EARNINGS	1,449,511,436.74	1,365,066,682.15
ADDITIONS TO CURRENT NET EARNINGS:		
Profit on sales of U. S. Government securities (net)	8,481,427.42	3,945,944.78
Profit on foreign exchange transactions	59,292,120.66	0
All other	108,967.31	4,997.44
TOTAL ADDITIONS	67,882,515.39	3,950,942.22
DEDUCTIONS FROM CURRENT NET EARNINGS:		
Losses on foreign exchange transactions	0	23,195,587.27
All other	571,148.99	434,806.93
TOTAL DEDUCTIONS	571,148.99	23,630,394.20
NET ADDITIONS OR DEDUCTIONS	+67,311,366.40	−19,679,451.98
Assessment for expenses of Board of Governors	3,849,200.00	4,149,300.00
Federal Reserve currency costs	15,923,504.12	14,240,516.86
NET EARNINGS BEFORE PAYMENTS TO U. S. TREASURY	$1,497,050,099.02	$1,326,997,413.31
Dividends paid	$ 5,149,817.38	$ 4,554,218.39
Payments to U. S. Treasury (interest on Federal Reserve notes)	1,481,448,481.64	1,316,246,794.92
Transferred to surplus	10,451,800.00	6,196,400.00
TOTAL	$1,497,050,099.02	$1,326,997,413.31

Surplus Account

Balance at close of previous year	$ 80,360,450.00	$ 74,164,050.00
Addition of profits for year	10,451,800.00	6,196,400.00
BALANCE AT CLOSE OF CURRENT YEAR	$ 90,812,250.00	$ 80,360,450.00

Capital Stock Account

(Representing amount paid in, which is 50% of amount subscribed)

Balance at close of previous year	$ 80,360,450.00	$ 74,164,050.00
Issued during the year	10,994,450.00	6,731,600.00
	91,354,900.00	80,895,650.00
Cancelled during the year	542,650.00	535,200.00
BALANCE AT CLOSE OF CURRENT YEAR	$ 90,812,250.00	$ 80,360,450.00

Directors (December 31, 1985)

Richmond

Leroy T. Canoles, Jr. — *Chairman of the Board*

Robert A. Georgine — *Deputy Chairman of the Board*

Class A

Robert F. Baronner — *Chairman of the Board & Chief Executive Officer*
One Valley Bancorp of West Virginia, Inc. and
Kanawha Valley Bank, N.A.
Charleston, West Virginia
(Term expires December 31, 1987)

Robert S. Chiles, Sr. — *President/Chief Executive Officer, Greensboro National Bank*
Greensboro, North Carolina
(Term expires December 31, 1986)

Willard H. Derrick — *President and Chief Executive Officer*
Sandy Spring National Bank and Savings Institution
Sandy Spring, Maryland
(Term expired December 31, 1985)

Succeeded by: **K. Donald Menefee**
Chairman of the Board & Chief Executive Officer
Madison National Bank
Chairman of the Board & President
James Madison Limited
Washington, D. C.
(Term expires December 31, 1988)

Class B

Thomas B. Cookerly — *President, Broadcast Division, Allbritton Communications*
Washington, D. C.
(Term expires December 31, 1986)

Floyd D. Gottwald, Jr. — *Chairman of the Board & Chief Executive Officer*
Ethyl Corporation
Richmond, Virginia
(Term expires December 31, 1987)

George Dean Johnson, Jr. — *Partner, Johnson, Smith, Hibbard, Cleveland, Wildman and Dennis*
Spartanburg, South Carolina
(Term expired December 31, 1985)

Succeeded by: **Edward H. Covell**
President
The Covell Company
Easton, Maryland
(Term expires December 31, 1988)

Class C

Leroy T. Canoles, Jr. — *President, Kaufman & Canoles*
Norfolk, Virginia
(Term expires December 31, 1986)

Robert A. Georgine — *President, Building & Construction Trades Department, AFL-CIO*
Washington, D. C.
(Term expires December 31, 1988)

Hanne Merriman — *President, Garfinckel's*
Washington, D. C.
(Term expires December 31, 1987)

Member of Federal Advisory Council

John G. Medlin, Jr. — *Chief Executive Officer, First Wachovia Corporation, The Wachovia Corporation, Wachovia Bank and Trust Company, N.A.*
Winston-Salem, North Carolina
(Term expires December 31, 1986)

Baltimore

Edward H. Covell — *President, The Covell Company*
Easton, Maryland
(Term expired December 31, 1985)

Succeeded by: Thomas R. Shelton
President and Chief Operating Officer
Perdue Farms, Incorporated
Salisbury, Maryland
(Term expires December 31, 1988)

Raymond V. Haysbert, Sr. — *President and Chief Executive Officer*
Parks Sausage Company
Baltimore, Maryland
(Term expires December 31, 1987)

Charles W. Hoff III — *President and Chief Executive Officer, Farmers and Mechanics National Bank*
Frederick, Maryland
(Term expires December 31, 1986)

Gloria L. Johnson — *President, Hutzler Brothers Company*
Baltimore, Maryland
(Term expires December 31, 1987)

Howard I. Scaggs — *Chairman of the Board, American National Building and Loan Association*
Baltimore, Maryland
(Term expired December 31, 1985)

Succeeded by: Joseph W. Mosmiller
Chairman of the Board
Loyola Federal Savings and Loan Association
Baltimore, Maryland
(Term expires December 31, 1988)

Hugh D. Shires — *Senior Vice President (Retired), The First National Bank of Maryland*
Cumberland, Maryland
(Term expired December 31, 1985)

Succeeded by: H. Grant Hathaway
Chairman of the Board
Equitable Bank, N.A.
Baltimore, Maryland
(Term expires December 31, 1988)

*Robert L. Tate — *Chairman, Tate Industries*
Baltimore, Maryland
(Term expires December 31, 1986)

Charlotte

G. Alex Bernhardt — *President, Bernhardt Industries, Inc.*
Lenoir, North Carolina
(Term expires December 31, 1988)

James E. Bostic, Jr. — *Division General Manager, Convenience Products Division*
Georgia-Pacific Corporation
Aiken, South Carolina
(Term expires December 31, 1987)

J. Donald Collier — *President and Chief Executive Officer, First National Bank*
Orangeburg, South Carolina
(Term expires December 31, 1988)

James M. Culberson, Jr. — *Chairman and President, The First National Bank of Randolph County*
Asheboro, North Carolina
(Term expires December 31, 1987)

John A. Hardin — *Chairman of the Board and President, First Federal Savings Bank*
Rock Hill, South Carolina
(Term expires December 31, 1986)

*Wallace J. Jorgenson — *President, Jefferson-Pilot Communications Company*
Charlotte, North Carolina
(Term expires December 31, 1986)

James G. Lindley — *Chairman, South Carolina National Corporation*
Chairman and President, The South Carolina National Bank
Columbia, South Carolina
(Term expires December 31, 1988)

*Branch Board Chairman.

Officers (January 1, 1986)

Richmond

Robert P. Black, *President*

Jimmie R. Monhollon, *First Vice President*

J. Alfred Broaddus, Jr., *Senior Vice President and Director of Research*

Welford S. Farmer, *Senior Vice President*

Roy L. Fauber, *Senior Vice President*

James D. Reese, *Senior Vice President*

Bruce J. Summers, *Senior Vice President*

J. Lander Allin, Jr., *Vice President*

Fred L. Bagwell, *Vice President*

Lloyd W. Bostian, Jr., *Vice President*

Timothy Q. Cook, *Vice President*

William E. Cullison, *Vice President*

Donna G. Dancy, *Vice President*

Wyatt F. Davis, *Vice President*

John M. Denkler, *Advisor*

George B. Evans, *Vice President*

William C. Fitzgerald, *Associate General Counsel*

William C. Glover, *Vice President*

Marvin S. Goodfriend, *Vice President*

Robert L. Hetzel, *Vice President*

Thomas M. Humphrey, *Vice President*

William D. Martin III, *Vice President and General Counsel*

Arthur V. Myers, Jr., *Vice President*

Joseph C. Ramage, *Vice President*

John W. Scott, *Vice President*

R. Wayne Stancil, *Vice President*

Andrew L. Tilton, *Vice President*

James F. Tucker, *Vice President*

Walter A. Varvel, *Vice President*

William H. Benner, Jr., *Assistant Vice President*

Jackson L. Blanton, *Assistant Vice President*

William A. Bridenstine, Jr., *Assistant General Counsel*

Bradford N. Carden, *Assistant Vice President*

Michael Dotsey, *Research Officer*

H. Lewis Garrett, *Assistant Vice President*

Sharon M. Haley, *Assistant Vice President and Secretary*

Harold T. Lipscomb, *Assistant Vice President*

Yash P. Mehra, *Research Officer*

Michael W. Newton, *Assistant Vice President*

G. Ronald Scharr, *Assistant Vice President*

Jesse W. Seamster, *Assistant Vice President*

James R. Slate, *Assistant Counsel*

Roy H. Webb, *Research Officer*

Jack H. Wyatt, *Assistant Vice President*

Bobby D. Wynn, *Assistant Vice President*

Kemper W. Baker, Jr., *Public Services Officer*

Floyd M. Dickinson, Jr., *Examining Officer*

Betty M. Fahed, *Statistical Officer*

Frances R. Hurdle, *Loan Officer*

Eugene W. Johnson, Jr., *Examining Officer*

Edgar A. Martindale III, *Budget and Control Officer*

Joseph F. Morrissette, *Public Services Officer*

Lawrence P. Nuckols, *Examining Officer*

Virginius H. Rosson, Jr., *Computer Services Officer*

Gary W. Schemmel, *Computer Planning Officer*

Marsha S. Shuler, *Planning Officer*

William F. White, *Examining Officer*

Howard S. Whitehead, *Integrated Accounting System Project Officer*

Arthur J. Zohab, Jr., *Examining Officer*

David B. Ayres, Jr., *General Auditor*

Thomas P. Kellam, *Audit Officer*

Baltimore

Robert D. McTeer, Jr., *Senior Vice President*

Ronald B. Duncan, *Vice President*

William E. Pascoe III, *Vice President*

Gerald L. Wilson, *Vice President*

Ronald E. Gould, *Assistant Vice President*

Robert A. Perry, *Assistant Vice President*

John S. Frain, *Operations Officer*

Charleston

Richard L. Hopkins, *Vice President*

Columbia

Boyd Z. Eubanks, *Vice President*

Charlotte

Albert D. Tinkelenberg, *Senior Vice President*

Samuel W. Powell, Jr., *Vice President*

Jefferson A. Walker, *Vice President*

Woody Y. Cain, *Assistant Vice President*

Marsha H. Malarz, *Assistant Vice President*

Francis L. Richbourg, *Assistant Vice President*

Harry B. Smith, *Assistant Vice President*

Robert F. Stratton, *Assistant Vice President*

Culpeper

John G. Stoides, *Senior Vice President*

James G. Dennis, *Assistant Vice President*

James J. Florin III, *Assistant Vice President*