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The Productivity of the Banking Sector: Integrating Financial and Production Approaches to Measuring Financial Services Output

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Abstract

Measurement of output for services in general, and for financial services in particular, has been seen as a challenge by economic data providers and users alike. In the context of the national accounts, financial services has traditionally been a controversial area principally because there is a significant component of these services for which payment is made implicitly through the spread between the asset interest earned and liability interest paid by financial services establishments. Although it is reasonably clear that the total sales of financial institutions are the net interest income on "produced" asset and liability products (such as loans and deposits for banks) plus explicit service charges, the correct allocation of the net interest component of those sales across households, government, and the rest of the world (final consumers)-has not been so well understood. Because the input side of financial services business is as straightforward as for any other sector we focus our attention on the measurement of output.

In this paper we have focused on the implications of the financial firm approach to conceptualizing and compiling an output index for financial services (that is, Divisia monetary and credit aggregation) that accounts for quality and "quantity discount" effects, and the recent change in recommendations for compiling financial services in national income accounting. We find that (1) the link between the real and monetary accounts is direct within the financial firm framework: the output index for the banking component of the financial business sector as identical with the financial stock aggregates that are the subject of central bank policy, (2) there exists an operational definition for the reference rate with an appealing conceptual interpretation that empirically gives heavier weight to sales of asset services than current U.S. imputation practice, and (3) quality adjustments for services characteristics are of two kinds: a standard adjustment for service characteristics relating to the facilitation and convenience of transactions and intermediation, and a second adjustment relating to "quantity discounts" for services rendered on larger accounts. This second adjustment is what provides a link between the fundamentally nominal monetary and financial asset stock measures and the real output measures needed for the national accounts and compilation of real GDP. The real output measure is, we argue, an important measure for the monetary authority, since it incorporates service characteristics relating to the efficiency of the transmission of policy actions such as open market operations.

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Introduction

Measurement of output for services in general, and for financial services in particular, has been seen as a challenge by economic data providers and users alike. Several years ago, we initiated a program of research charting a comprehensive and mutually consistent system of economic statistics for financial business. A brief sketch of our overall program will set the context of the productivity measurement component, which is the focus of this paper.

In the context of the national accounts, financial services has traditionally been a controversial area principally because there is a significant component of these services for which payment is made implicitly through the spread between the asset interest earned and liability interest paid by financial services establishments. Although it is reasonably clear that the total sales of financial institutions are the net interest income on "produced" asset and liability products (such as loans and deposits for banks) plus explicit service charges, the correct allocation of the net interest component of those sales across the consuming sectors of the economy—business (intermediate consumers), households, government, and the rest of the world (final consumers)—has not been so well understood.

Recent revisions in national accounting rules for this sector, intersected with the developments since the late 1970s in the microeconomic theory of financial firms and of household consumption of financial asset services (Diewert [1974], Barnett [1978], Donovan [1978], Hancock [1985]) are signal developments in our understanding of the economics of and measurement possibilities for this sector. Central to, and an important contribution of, this last line of literature has been the characterization of the prices of individual service products in terms of the Barnett (1978)-Donovan(1978) user cost of money. These user cost prices are simple functions of items, such as interest rates, that can be measured in financial market

transactions. The principal practical economic measurement issues these developments have illuminated are twofold:

- How the total sales of financial business should be allocated between intermediate and final consuming sectors of the economy; and,
- How movement in the total sales of financial business should be divided into price and volume components.

By and large, the input side of financial services business is as straightforward as for any other sector, characterized by purchases of primary factor services from the owners of labor and capital and purchases of produced goods and services from other business sectors. The sole exception to this is the consumption of financial services for own use, or by other establishments in the same sector, which is subject to the same measurement issues as output.

Fixler and Zieschang (1991) discussed these issues in some detail, and provided background on the treatment of financial business in the national accounts historically. More recently, a consortium of international organizations comprising the United Nations secretariat, the World Bank, the International Monetary Fund, the Organization for Economic Cooperation and Development, and the European Statistical Agency issued an updated international standard system of national accounts. The *System of National Accounts 1993* (*SNA93*) recommends, as a first option, the calculation of imputed sectoral financial services sales—termed Financial Intermediation Services Implicitly Measured or FISIM—according to a user cost principle.

Concomitant with solving, at least in principle, the two major measurement issues above, there has been the emergence of a unified measurement framework for financial services based on the following equalities:

- The monetary and asset aggregate = the real gross product of financial services = the volume component of total sales; and,
- The output price index (producer price index) of financial services = the price component of total sales

Fixler and Zieschang (1992a) and Fixler (1993) applied the user cost based financial firm framework to the measurement of output and the construction of output price indexes. Fixler and Zieschang (1997) assess the implications of the above equalities for constructing a consistent system of financial sector statistics that illuminates the transmission mechanism of central bank monetary policy actions, such as open market operations, from the financial to real sectors of the economy.

Productivity, of course, tracks output divided by input, and the implications for financial services productivity measurement of the above developments are immediate. Fixler and Zieschang (1992b) provided a methodology, based on the exact index number results of Caves Christensen, and Diewert (1982), for financial services productivity measurement within this new framework. A key feature of the framework is the endogenous assignment of financial output-input status to the various financial products provided by a financial firm. Historically, the treatment of deposit products has been the subject of considerable debate; should they be treated as inputs because the attending funds are the raw material of loan-making, or should they be treated as output because of the transaction, recordkeeping and safekeeping services that they provide. In the user cost framework the sign of the user cost provides the answer: a negative sign indicates an output status and a positive sign indicates input status. The assigned status is not permanent as changes in interest rates can alter the status of a particular deposit product. However, for deposits as a whole, experience with the data shows they are consistently outputs under the user cost approach.

Significantly, we also provided for the incorporation of additional information on the characteristics of financial services into productivity (and, by implication, price and quantity) measures, based on earlier work at the U.S. Bureau of Labor Statistics (Zieschang [1985, 1989]). This leads to another issue this paper addresses, which is

- Since the nature of the financial services sale transaction expresses the prices of financial services as rates per unit of currency on account in a particular financial product, such as a deposit account, in what sense is the dual volume measure "real," since it indicates movements in nominal currency values held or owed by product?

Standard practice in the literature characterizing the price of financial product services in terms of the user cost of money has been to find a commodity price index to further deflate the volume component to obtain a "real" output indicator. By implication, therefore, the result from deflating financial institution sales by a user cost price index has been taken by user cost analysts not to be a volume index. Fixler and Zieschang (1991, 1992a,b) departed from this practice. Our reason rests on the nature of the sale transaction between the bank and its customers, which, other than those services having separate, explicit charges, characterizes the purchase price as a dimensionless rate on an amount in currency units deposited or borrowed measured. However, we believe equally strongly that accounting for movements in services characteristics associated with these service purchase transactions is critical to obtaining a defensible banking services volume measure. These characteristics would include the usual items such as number of accounts of each type serviced and the transaction volume per account by type, such as whether ATM- or PC- or electronic transfer-initiated, as well as the less obvious average account size, which is generally inversely associated with the user cost price of both asset and liability service products. This latter "quantity discount" characteristic of financial services pricing will offset

output growth that is accompanied by an increase in average account size. Since average account size is directly related to the rate of increase in goods and services prices generally, this "quality" modifier will have a similar effect to the commonly-applied econometric practice of deflating nominal account values by a general price index.

Aside from national income and product account concerns, there are some particular reasons for examining the productivity of the providers of financial services. First, as shown in Fixler and Zieschang (1992b), from measures of the relative productivity (efficiency) of individual institutions inferences can be drawn about the distribution and central tendency of the relative efficiency of institutions in the financial services industry for given time intervals. Second, temporal movements in the productivity of institutions has implications for aggregate technological change and capital accumulation over time. Both of these dimensions are important from the perspective of examining the money transmission story. An unmeasured change in either the distribution of individual institution productivities or in the prevailing transactions technology (i.e., e-cash, Automatic Teller Machines, etc.), will affect the money multiplier relating a change in reserves to its *effective* monetary services impact.

The relationship between the output and performance of the financial services sector and monetary policy is also linked to the measurement of the monetary aggregate at a given state of technology. In fact, perhaps, the best developed area of application of the user cost principle for financial services is in the measurement of monetary aggregates pioneered by Barnett (1978, 1980), and burgeoning into a large international literature on how the monetary authority should measure the money supply. Although the empirical evidence is not unanimous, a preponderance of results favor the use of user-cost-weighted indexes of monetary components over the simple sum aggregates that have traditionally measured monetary stocks. In general, the broad "Divisia" user cost weighted aggregates have a more intuitive and reliable relationship with the associated aggregate user cost prices, and greater explanatory power in models of the demand and supply of

money and its relationship to aggregate production and consumption. See for example Anderson et al (1996) for a recent review of this now substantial literature.

The remainder of the paper is organized in the following way. We begin by noting the basic accounting structure of income statements and balance sheets of U.S. banking firms as given in the Call Reports. We briefly revisit the conceptual framework for a financial firm considered in Hancock (1985) and Barnett (1987). We consider the price of financial services, the *SNA93* accounting framework for gross value of output, and output and price measurement in the financial firm context. We construct a benchmark rate for the 1993-1996 period using data from the Federal Deposit Insurance Corporation (FDIC) on the maturity structure of assets and liabilities of commercial banks, and data on the rates earned on Treasury securities. We discuss its use in constructing an output index for commercial banking. We then examine the implications for the financial services output measure implied by the Divisia/FISIM framework of accounting for some measurable or potentially measurable service characteristics. In this vein, we focus specially on the treatment and impact of average account size and number of accounts on the volume measure, providing some empirical evidence from the FDIC data on the sizes of these impacts on the user cost price and their probable effects on components of the services volume measure. Where possible, we examine the empirical issues raised under each topic by reference to the available data.

Conceptual framework

Flows of income and expense and stocks of assets and liabilities: financial products within the accounting structure of a U.S. banking firm

A financial firm is viewed as transforming nonfinancial inputs x into financial service products y. The collection of products y is measured in monetary units as the amounts in various

liability and asset accounts[1]. We write $y = (y_A, y_L)$ to indicate the asset and liability components of the financial product vector. Table 1 depicts some 30 products, and elements of our output vector y, that can be identified in the principal U.S. bank regulatory data set, the quarterly Reports of Condition and Income (Call Reports) collected by the Federal Deposit Insurance Corporation, the Comptroller of the Currency, and the Board of Governors of the Federal Reserve System. These items were selected because both interest/noninterest income/expense flows and the size of the stock of funds in the associated account are available for them.[2]

The price of financial services

The Barnett/Donovan value or user cost price per currency unit of monetary services for output y_i is given by

$$p_i = \begin{cases} p_{Ai} = h_i - \rho & ; \text{ if the item is an asset} \\ p_{Li} = \rho - h_i & ; \text{ if the item is a liability} \end{cases} \qquad (1)$$

where

$$h_i = \begin{cases} h_i = r_i + s_i + \pi_i - d_i & ; \text{ if the item is an asset} \\ h_i = r_i - s_i & ; \text{ if the item is a liability} \end{cases}$$

where the asset holding income rate h is the sum of the interest rate received on the item r plus directly levied service charge rate s and the expected appreciation rate π, minus the rate d at

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[1]One of the contentious issues in the banking literature is whether some liability products (mainly deposits) should be designated as inputs. Hence the designation of nonfinancial inputs. In the financial firm model the financial input-output status of a product is determined by the sign of the product's user cost price, discussed below. In this framework the focus is on the production of financial services and so the designation of a product as a financial input-output is a subsidiary concern.

[2] The Department of Commerce 1992 Census of Financial, Insurance, and Real Estate Industries also contains information in its *Sources of Revenue Report* that augments the detail of direct service charge income available in the Call Reports. Additional detail in certain other areas of bank and depository institution activity are provided in the *Establishment and Firm Size* and *Miscellaneous Subjects Reports.* The next such Census will be taken in 1998.

which reserves for loan losses are taken. The liability holding cost rate is the sum of the interest rate paid r— principally on deposit accounts—net of the directly-levied service charge rate s.[3] The scalar variable ρ is the Barnett *benchmark rate*, and the Hancock *opportunity cost rate of money*, and the *SNA93*'s *reference rate*.

The gross value of financial services output

The value of sales for the firm at user cost prices is

$$
\begin{aligned}
S = p'y &= p_A' y_A + p_L' y_L \\
&= \left[r_A + s_A - d - lr - \rho 1\right]' y_A + \left[\rho + s_L - r_L\right]' y_L + \pi' y_A \\
&= \left[\left(r_A + s_A - d - lr\right)' y_A - \left(r_L - s_L\right)' y_L\right] + \rho\left[\iota' y_A - \iota' y_L\right] + \pi' y_A \\
&= \left[\left(r_A + s_A - d - lr\right)' y_A - \left(r_L - s_L\right)' y_L\right] + \pi' y_A \qquad (2)
\end{aligned}
$$

The scalar variable ρ in equation (2) is, again, the Barnett *benchmark rate* and the Hancock *opportunity cost rate of money*, and the *SNA93*'s *reference rate* identified in equation (1) as ρ.

In the *SNA93* framework, the sales of financial services are given by the first bracketed term in equation (2). The term $\pi' y_A$ is accounted for in the asset revaluation account and is not included in the value of financial services sales; this is a long-held national accounting convention. Whether to include asset revaluations in the value of services produced is a topic under discussion for future revisions of the national accounting system. We will adopt the *SNA* convention for the moment and exclude asset revaluations $\pi' y_A$ from the value of financial services sales.

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[3]These user cost expressions follow from the profit maximization problem solved by the financial firm. Hancock (1985) provides a detailed derivation. We ignore the role of discounting. We also treat non-interest-bearing assets, such as reserve balances held with the central bank, distinctly, rather than adjusting the prices of assets for the "reserve tax" by multiplying the benchmark rate by one minus the reserve ratio, as in Barnett's treatment.

Because total assets must equal total liabilities to exhaust the monetary interest and service charge income plus asset revaluations received by financial firms, it must be the case that

$$\iota' y_A - \iota' y_L = 0$$

where ι is a vector of ones of the appropriate dimension. Without this equality, the income of a solvent firm at user cost prices of services sales from financial products sales could be less than accounting income plus asset revaluations by an amount equal to the reference rate times the difference between assets and liabilities included in the product vector. Under the balance sheet constraint, the "economic revenue" at user cost prices (excluding asset revaluations) of the financial firm therefore equals the "net interest received" component of "accounting revenue". This net interest aggregate is what national accountants call "net property income." It and explicit service charges comprise the gross value of output of financial services by the financial business sector.

The scope of assets and liabilities covered by this balance sheet constraint deserves further explanation. We are including liabilities ordered by deposits, subordinated debt (borrowed funds), and stockholders' equity, only up to the value of the aggregate of earning assets.[4] We define scope of financial stocks yielding financial services in this way because our focus is on the financial service products provided by commercial banks (or generally financial service firms), largely deposit and credit services. By implication, physical capital and

[4] In fact, the composition of the liability aggregate from which funds are generated to supply asset products should involve a calculus of matching the maturities of assets and liabilities to maintain the bank's solvency within the risk tolerances of management and regulators. Most obviously, mortgages will be matched with real estate and equipment, by which they are generally secured, as will some portion of stockholders' equity. Subordinated debt, equity, and certificates of deposit would be matched with long term lending. Time deposits and short certificates of deposit would be matched with short to medium term lending, and demand deposits would be matched with money market securities.

stockholders' equity are not included in sales at user cost prices (and hence in measuring the volume of financial services). Gross sales is the interest income earned on credit assets net of interest expense on deposits and that part of borrowed funds used to fund credit assets.

Discussion among the national accounting community on implementing the *SNA93* has thus far considered this "loanable funds" approach to defining the scope of financial products having balance sheet counterparts. (See Begg, Bournay, Weale, and Wright (1996) for a discussion of balance sheet constraints and a description of current thinking on how the 1993 SNA should be implemented.) The reason is that physical capital assets are considered a primary input and not an output, and the corresponding liabilities comprising stockholders' equity and residual portion of borrowed funds constitute the financial instruments through which owners claim the income earned on the deployment of that physical capital.

The production function and multifactor productivity

The joint production function of financial services in output distance function form is given by

$$D(x, y_A y_L) = D(x, y) = \left[\sup_\theta \{\theta : \theta y \text{ is feasible for inputs } x\}\right]^{-1}.$$

The output distance function also can be interpreted as the output efficiency function following Shephard (1970), and a voluminous literature in the economics and operations research literature on efficiency and productivity measurement.[5] Following Caves, Christensen, and Diewert (CCD, 1982), the index of multifactor productivity can be defined in a form that is homogeneous in input or output quantities. It is given as the following ratio of distance functions:

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[5]See Fixler and Zieschang, (1992a,b, 1993) for applications of the output distance function to measuring the productivity of banks.

$$P = \frac{D(x^t, y^t)}{D(x^{t-1}, y^{t-1})}.$$

Implications of the financial firm model for economic statistics and productivity

Monetary and credit aggregates=output

Financial services output within the financial firm framework is dealt with in Hancock (1985), Barnett, Hinich, and Weber (1986), and Barnett (1987). As with other sectors, bank output is multidimensional, in this case a vector whose elements are an institution's holdings of produced assets, such as loans and securities, and liabilities, such as deposits. Inputs are the usual primary factors, labor and capital, as well as purchases of items produced by other industrial sectors, such as computer services and equipment, office supplies, rental of space, and so on.

The output quantity index of financial services is determined according to Malmquist (1953) and Moorsteen (1961) as

$$Q^{t-1,t} = \frac{D(x, y^t)}{D(x, y^{t-1})}, \tag{3}$$

the ratio of output distance or efficiency functions comparing two output vectors while holding inputs constant at a reference level. If the distance function is translog, as

$$\ln D^t(x, y_A, y_L) = \ln D^t(x, y)$$
$$= \alpha_0^t + \alpha_x^{t\prime} \ln x + \alpha_p^{t\prime} \ln y + \ln x' \Lambda_{xy} \ln y + \ln x' \Lambda_{xx} \ln x + \ln y \Lambda_{yy} \ln y$$

which is a second order approximation at a point to any twice differentiable D, the output quantity index is exactly[6]

$$Q^{t-1,t} = \exp\left[\tfrac{1}{2}(w_A^{t-1} + w_A^t)'(\ln y_A^t - \ln y_A^{t-1}) + \tfrac{1}{2}(w_L^{t-1} + w_L^t)'(\ln y_L^t - \ln y_L^{t-1})\right] \quad (4)$$

Examination of equation (4) reveals that the quantity index is the product of a **broad Divisia financial asset aggregate** and a **broad Divisia monetary (financial liability) aggregate**.[7] There is a large international literature on the use of these aggregates and various of their subaggregates for monetary policy, beginning with Barnett's seminal 1980 article. Even though both aggregates are relevant to the question of how monetary policy is transmitted into the real sector of the economy, the greatest focus in recent years, especially with regard to Divisia aggregates, has been on the liability (deposit) products, plus currency in circulation.

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[6] The index (4) is exact if the distance function is homothetic in y— $D(x,y) = f(x)\phi(y)$—or if the quantity index is defined in the "Fisher" manner as

$$Q^{t-1,t} = \left[\frac{D^{t-1}(x^{t-1}, y^t)}{D^{t-1}(x^{t-1}, y^{t-1})} \frac{D^t(x^t, y^t)}{D^t(x^t, y^{t-1})}\right]^{\frac{1}{2}}$$

under certain conditions. See Caves, Christensen, and Diewert (1982).

[7] For the private banking sector, this excludes currency in circulation, as it is a liability of the central bank and held outside this sector. However, if the financial business sector includes the central bank, as in the US, currency in circulation would be included as part of the set of financial liabilities.

Financial product aggregates and multifactor productivity

Under the assumption of the translog form for the output distance function, CCD (1982) derived the following exact index number result:

$$P_F^{t-1,t} = \left[\frac{D^{t-1}\left(y^t, x^t\right)}{D^{t-1}\left(y^{t-1}, x^{t-1}\right)} \frac{D^t\left(y^t, x^t\right)}{D^t\left(y^{t-1}, x^{t-1}\right)} \right]^{\frac{1}{2}} = \frac{Q}{X}$$

where Q is the Törnqvist output index in equation (3), X is a Törnqvist-type input index with exponential weights depending on the elasticity of scale, in addition to the input cost shares.[8]

The available input data on banks from the Call Reports include Premises and fixed assets, Full time equivalent employees, and Other noninterest expense. See Fixler and Zieschang (FZ 1992b). Clearly, there is work to do in the first and last categories. Capital is measured at book value, a less than optimal quantity measure for that input, and there are no specific deflators for Other noninterest expense to obtain a volume measure for that set of inputs. Nevertheless, the greatest challenge for this sector lies in the output aggregate Q, both in productivity measurement, and in the linkage between the real accounts and the monetary accounts. We, therefore, direct our attention in the remainder of this paper to output measurement.

[8] CCD(1982) also show that under non-increasing returns to scale, the exponential weights in the input formula reduce to the ratio of input costs by category to total sales.

Implementing the output measurement framework for commercial banks

The reference rate

Clearly, the linchpin of an integrated approach to macroeconomic measurement of financial services built around the Barnett/Donovan rental price of money concept is the opportunity cost rate/benchmark rate/reference rate ρ. Practical considerations require that this benchmark be readily measurable from observed deposit, money market, security, and asset rates. United States GDP data currently include a type of FISIM imputation which effectively takes the benchmark rate as the average rate earned on all produced assets of financial institutions (Fixler and Zieschang 1991), which improperly includes returns on risky assets.[9]

Barnett (1978) focused on the measurement of the transaction services demanded by households and supplied by the deposit liability items also appearing in the financial firm production model above, as well as currency in circulation. He proposed that the benchmark rate be computed in effect as the maximum of a set of rates including treasury securities and the Baa corporate bond rate. The position taken by the *SNA93* on determining the reference rate is that

> The reference rate to be used represents the pure cost of borrowing funds--that is, a rate from which the risk premium has been eliminated to the greatest extent possible and which does not include any intermediation services. The type of rate chosen as the reference rate may differ from country to country but the inter-bank lending rate would be a suitable choice when available; alternatively, the central bank lending rate could be used. (*SNA93*, paragraph 6.128)

[9]Barnett, *et al*, "Beyond the Risk Neutral Utility Function," October 1994, deals. among other things, with how the rental price of money would be characterized in a financial firm model with a risky portfolio of assets.

The *SNA93* thus takes a less sharply framed view of determining the benchmark rate, the test being that the corresponding asset be essentially credit risk free and offer no intermediation services. Clearly, some consensus will need to be reached on how the benchmark rate is to be determined between the statistical offices usually responsible for prices and national accounts on one hand, and the central bank, which usually compiles interest and monetary stock data.

Our suggestion would compile the reference rate(s) for FISIM from a single source of interest rate data, the rates on U.S. Treasury securities of various maturities, in concert with data on the maturity structure of bank portfolios of loans and deposits, to arrive at (1) a national average reference rate, and (2), if possible, reference rates specific to the maturity structures of the asset and liability positions of banks with each consuming sector. Some of the data for compiling these statistics exist for the United States. See Table 1 and its footnotes for the availability of maturity information by type of product.

Aside for its being operational with available data, we believe this approach to the reference rate integrates with the conceptual framework. First, the reference rate so calculated would have no risk premium built in, but would reflect the maturity structure of bank asset portfolios. This reference rate would generate an estimate of the rate of return should the current asset portfolio of the system be converted entirely to government securities, as if all banks operated as narrow banks, facilitating transactions, but not intermediating between depositors and borrowers.[10]

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[10] We point out that the use of reference rates customized to the maturity structures of individual financial products has implications for the balance sheet constraint discussed above. When there is a term structure of interest rates, sales are equal to net property income plus service charges in equation (2) only if balance sheet constraints hold for each maturity. This condition will hold if banks "maturity match" their asset and liability portfolios. In the face of a term structure of interest rates, matching the maturity structures of assets and liabilities must be, in fact, an objective of bank management in order to maintain solvency and meet current obligations. Unfortunately, although data on the maturity structure of deposits has been collected in the Call reports in certain past years, these data are not available currently. Although we may still be able to assert that bank sales are essentially net interest plus service charges based on the maturity matching argument, we cannot perform a sectoral allocation of depositor service sales that accounts for deposit maturity structure by sector, and are forced to estimate sales to institutional sectors using a single reference rate such as the overall reference rate for assets.

Some empirical evidence

Table 2 depicts the construction of the reference rate along the lines we would prefer. The first three panels give the portfolio percentages by maturity for total produced assets, as well as for the loan and security components. These panels show a rather stable maturity composition of bank assets at this high level of aggregation, with the greatest concentration in the shortest, zero to three month maturity, followed by the middle, one to five year category. A set of treasury security rates of approximately similar maturities to the asset breakdowns in the Call Reports are shown in the fourth panel. The fifth panel shows the reference rate overall, and for loans and securities individually, calculated as a maturity-weighted average of riskless security rates. The next line of the table provides the one year Treasury bond rate, used in Fixler and Zieschang (FZ 1997), for comparison purposes. Finally, the last and sixth panel of Table 2 shows average interest rates and user cost prices for three products: deposits in domestic offices, commercial and industrial loans, and loans to farmers, that we will revisit in our discussion of quality effects, below. Of interest for the moment is that all three have consistently positive user cost prices, and hence output status, over the four years.

Also of note is the fact that the preferred overall reference rate is higher than the 1 year bond rate for all four years. On the other hand, the benchmark rate for loan and lease products is lower than the overall rate and almost the same as the 1 year bond rate, reflecting their relatively short maturity structure compared with securities.

Gross output quantity and price indexes

FZ (1997) compute Törnqvist asset and liability product indexes and then take the product of them to obtain a Törnqvist financial service output price index as in equation (4). An implicit price is derived by using the quantity index to deflate a normalized series for aggregate bank service charge and net interest income. The study examines the movement in output and

prices for financial services without considering service characteristics for the historical period from 1961 to 1994. The data come from the Flow of Funds compiled by the Federal Reserve and the Reports of Income and Condition compiled by the Federal Deposit Insurance Corporation (FDIC). The banking sector defined there consists of US chartered commercial banks. For this sector the majority of the Flow of Funds data come from changes in the levels of the FDIC data.

Six financial service products identifiable in the Flow of Funds. The four asset products are: Cash and Balances Due from Depository Institutions, Loans, Securities and Federal Funds Sold and Securities Purchased. The two liability products are: Deposits and Federal Funds Purchased and Securities sold.

To construct the user cost prices for each of these products a benchmark rate must be specified, along with unit value interest rates for each of the products.[11] For the benchmark rate FZ (1997) use the one year constant maturity Treasury bond rate.[12] This was selected because it is considered riskless and represents an opportunity cost for any of the potential uses of liabilities. As discussed in the previous section, the maturity weighted reference rate for loans and leases is about the same as the 1 year bond rate and thus there should be little effect from this benchmark rate calculation for these asset products over the 1993-96 period. The security reference rate is somewhat higher than the loan reference rate, and hence securities are slightly overweighted in that study. In any case, Fixler and Zieschang (1992a) show that temporal bank *gross* output indexes are fairly robust to the specified benchmark rate. The interest rates earned and paid on the various products are computed by dividing the yearly income and expense by the corresponding stock.

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[11] Unit value interest rates are the ratios of the interest income or expense reported on various accounts divided by the balance sheet levels of the associated assets or liabilities.

[12] A constant maturity rate for a given date is taken for a given maturity is read from a yield curve constructed as of that date.

In Table 3 we present the various quantity indexes and the overall implicit price index calculated by FZ (1997). As shown in columns three and five of the Table, the results of this calculation are remarkable in that essentially all of the growth of bank gross output over the past thirty five years has been in liability products, primarily deposit (monetary) products, rather than credit services. There has been almost no growth over the entire period in the gross production of credit services. Monetary services have therefore driven the growth in aggregate financial services gross output, displayed in column six. As shown in column seven, the overall price index of financial services declined from 1961-65, rose from 1965-70, declined through 1975, abruptly found a new higher plateau in 1976, and another higher plateau in 1982 after a brief trough in 1981. Another trough in the index occurred in 1990, recovering in 1991 and then trending upward on a somewhat volatile course to historically high values through 1994.

Although not presented here FZ (1997) also construct an alternative nominal final sales figure under the user cost framework. We found that nominal sales are generally understated with the current BEA FISIM method, which is effectively based on a reference rate equal to the average return on loans and securities (FZ 1991), as compared with our FZ (1997) method, which is based on the lower one year Treasury bond rate for the period from 1951-1985. After 1985, the nominal sales of the user cost method are lower, but almost converge again by 1993.

Measuring the quality of financial services

Series such as that presented in Table 3 accurately measure trends in output only if adjustments for changes in product quality are made. The quality of deposit services can be characterized by service characteristics, such as volume of transactions per account, ATM sites and number of branches (convenience). The implications of increases in service quality in financial services, while having the usual interpretation as output augmenting, have a significant parallel interpretation for monetary policy, since financial services output volume is identical

with broad financial stock aggregates that are the subjects of central bank influence and control. A rise in service quality augments the stock of monetary and financial assets. It can be seen as an increase in the velocity with which a given unadjusted stock turns over, although, quality adjusted, velocity may not have changed at all.

FZ (1992b) provide a straightforward methodology for incorporating service characteristics into superlative quantity indexes such as the financial output aggregates defined in the previous section. We rely on knowledge of a hedonic relationship between the asset or liability holding cost rate and the service characteristics of the associated account as in

$$h = H(z, \delta, \varepsilon)$$

where h is the holding cost, H is the hedonic function, z is a vector of service characteristics, δ is a vector of other conditioning variables, and ε is a random error.

FZ (1992b) establish that within a Törnqvist index framework, an exact quality adjusted quantity index Q* can be derived as

$$Q^* = ZQ$$

where the quality modifier Z to the quantity index Q is

$$Z = \prod_m \left[\prod_j \left(\frac{z_{ajm}^t}{z_{ajm}^{t-1}} \right)^{\frac{1}{2}\left(\beta_{ajm}^{t-1} \frac{p_{aj}^{t-1} y_{aj}^{t-1}}{\sum_j p_{aj}^{t-1} y_{aj}^{t-1}} + \beta_{ajm}^{t-1} \frac{p_{aj}^{t-1} y_{aj}^{t-1}}{\sum_j p_{aj}^{t-1} y_{aj}^{t-1}} \right)} \prod_k \left(\frac{z_{lkm}^t}{z_{lkm}^{t-1}} \right)^{\frac{1}{2}\left(\beta_{lkm}^{t-1} \frac{p_{lk}^{t-1} y_{lk}^{t-1}}{\sum_k p_{lk}^{t-1} y_{lk}^{t-1}} + \beta_{lkm}^{t-1} \frac{p_{lk}^{t-1} y_{lk}^{t-1}}{\sum_k p_{lk}^{t-1} y_{lk}^{t-1}} \right)} \right] \quad (5)$$

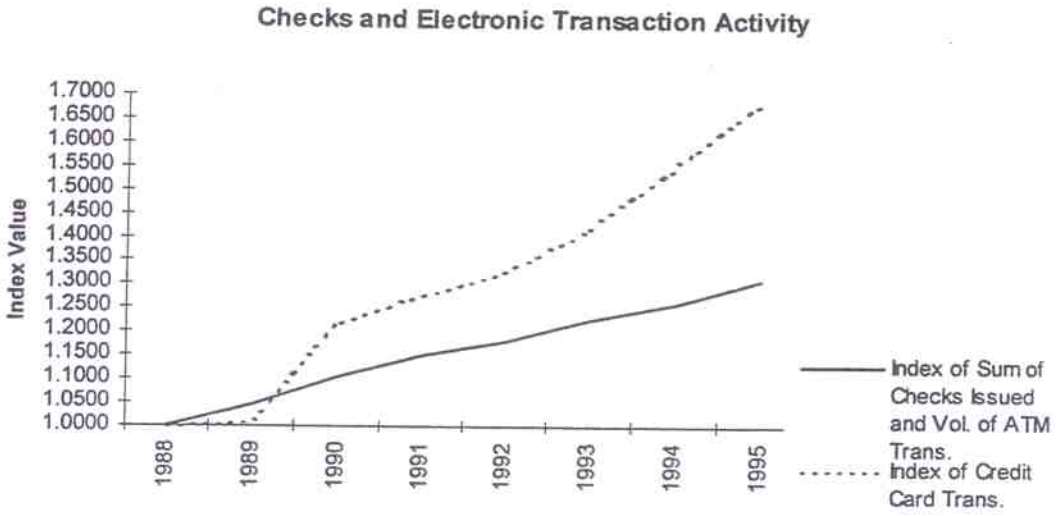
and where t indexes time, m indexes service characteristics, j indexes asset products, and k indexes liability products. The β terms are given by

$$\beta_{qrs}^{t} = \frac{\partial \ln H_{qr}^{t}\left(z_{qr}^{t}, \delta_{qr}^{t}\right)}{\partial \ln z_{qrs}^{t}}$$

and represents the proportional impact at time t of on the holding cost of product r of type q (asset or liability) of a marginal change in the s^{th} service characteristic.

The data available on the service characteristics z of banking services in the U.S. include counts of six types of branches compiled in the Call Reports,[13] and number of sites for automatic teller machines (ATMs), and transaction volume for checks cleared, ATMs, and electronic funds transfers published by the Bank for International Settlements (BIS) for a significant subset of large banking institutions and ATM network providers. The BIS data are graphed in the following figure

[13] Unfortunately these branch count data, which are computed from information in the so-called structure file of the Call Reports, are no longer available on the main micro file maintained by the Federal Reserve Board because of lack of use.



The 1988 volume of transactions was 55490 million and the 1995 volume was 72663 million, indicating an average annual rate of growth of nearly 4%. The level of credit card activity has increased even more substantially: the 1988 volume of credit card payments is 8813 million and the 1995 volume of transactions is 14914 million, for an average annual growth of about 8%.

ATM services are increasingly priced with explicit transaction charges. Typical recent ATM terms in the Washington, DC area are 25 to 50 cents per transaction on an ATM of the "home" institution of the account accessed, and $1 to $2 on transactions from a "foreign" ATM. However, offsets are often given when the deposit balances of an account holder exceed certain levels, and these services were often "free" or implicitly priced only a few years ago. Clearly, ATM services are a source of sales revenue and would generally increase the user cost price charged on the associated deposit accounts, notwithstanding the offsets (although more about these below).[14] Examining our formula in equation (5), then, for a given distribution of account

[14] See items 22 and 23 in Table 1. A hedonic regression of the interest holding income from credit cards on number of transactions could identify this effect, but would require micro data on deposit interest holding cost (RIAD4508

sizes, growth in ATM transactions would *augment* the growth in output measured by the unadjusted Divisia monetary and credit aggregate.

Credit card transactions, on the other hand, are still generally only implicitly priced, often with no charge on accounts paid in full every month. The impact of credit card transactions is less clear, but we expect that, again, the credit card transactions will have a positive, although arguably quite small, impact on the holding income earned on credit card loans.[15] By implication, the robust growth in credit card transactions will have the (likely quite modest) effect of *augmenting* the growth of the unadjusted Divisia aggregate.

The "quantity discount" and number of accounts effects on the volume index of financial services

As stated in the Introduction, the adjustment of the financial product output index to account for nominal changes unrelated to the production of services involves the relationship between the holding income/cost rates of products and the average account size. We suggest that effective service "quantity discounts" on the nominal size of accounts will act to offset changes arising from essentially nominal sources in a manner similar to deflation, but using information solely from the way banking service transactions are defined. For deposit and other liability

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+ RIAD4509 + RIAD4511 + RIAD4174 + RIAD4512), and deposit holding income from service charges (RIAD4080), as well as number of ATM transactions by institution. The holding income can be taken from the Call Reports, and there exists limited data on about 50 institutions on transactions, which also is the source of the BIS data. We are investigating these data presently. Certain of the institutions in the transactions data have no obvious single correspondent in the Call Reports, however, as when they are specialized to providing ATM services for a group of banks.

[15] See item 6, Loans to individuals in Table 1. Unfortunately, credit card loans are not separately identified on the Call Reports, but the interest income earned on them (RIAD4054) is. A hedonic regression of the interest holding income from credit cards on number of transactions could identify this effect, but would require micro data on credit card holding income and number of transactions by institution. The holding income can be taken from the Call Reports, but we are unaware of a readily available source of micro data on credit card transactions. However, such data may well be uncovered as the search continues.

products, a quantity discount would be indicated by a direct relationship between the deposit holding cost rate and the amount deposited. For loans and other asset products, a quantity discount would be characterized by an inverse relationship between the holding income rate and loan amount. This is, in fact, a common pricing strategy in banking, with deposit service charge rates phased out as minimum balance requirements are satisfied, and with rates on "jumbo" loans often discounted compared with those on smaller amounts.[16]

To adjust our volume index to account for this effect, we treat average account size as if it were a quality variable in our quality-adjusted formula. We posit the following "hedonic" equation,

$$h = H(\bar{y}, z, \delta, \varepsilon), \tag{6}$$

treating average account size $\bar{y}$ in the same way as the service characteristics vector z. The factor adjusting output for average account size in a comparison between periods t and $t+1$ would then be

$$V = \prod_j \left(\frac{\bar{y}_{aj}^{t}}{\bar{y}_{aj}^{t-1}} \right)^{\frac{1}{2}\left(\beta_{aj}^{t-1} \frac{p_{aj}^{t-1} y_{aj}^{t-1}}{\sum_j p_{aj}^{t-1} y_{aj}^{t-1}} + \beta_{ajm}^{t} \frac{p_{aj}^{t} y_{aj}^{t}}{\sum_j p_{aj}^{t} y_{aj}^{t}} \right)} \prod_k \left(\frac{\bar{y}_{lk}^{t}}{\bar{y}_{lk}^{t-1}} \right)^{\frac{1}{2}\left(\beta_{lk}^{t-1} \frac{p_{lk}^{t-1} y_{lk}^{t-1}}{\sum_j p_{lk}^{t-1} y_{lk}^{t-1}} + \beta_{lkm}^{t} \frac{p_{lk}^{t} y_{lk}^{t}}{\sum_j p_{lk}^{t} y_{lk}^{t}} \right)} \tag{7}$$

where j and k index, respectively, asset and liability account types, and

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[16] See, for example, the **Survey of Terms of Bank Lending** made during February 3-7, 1997, Fed Survey E.2. These data show that, for fixed rate Commercial and Industrial Loans of less than one year maturity, the interest rate falls with the size of the loan.

$$\beta_{rs}^{t} = \frac{\partial \ln H_{rs}^{t}\left(\bar{y}_{rs}^{t}, z_{rs}^{t}, \delta_{rs}^{t}\right)}{\partial \ln \bar{y}_{rs}^{t}} .$$

In summary, then, our quality adjusted output index would be written as

$$Q^{**} = VZQ .$$

Clearly, if $\beta_{rs}^{t} = 0$, then average account size has no effect on the essentially nominal output aggregate. However, we expect that in many cases this parameter is negative, in which case equation (7) implies an *attenuation* of growth in the unadjusted asset and monetary output aggregate as average account size increases. Note that this is straightforwardly generalizable to the case in which the holding cost of one account depends on other average account sizes besides its own. This is a potentially useful approach to consider for handling service bundles offered in retail banking, where, for example the combined value of several types of accounts for a given customer determines the holding costs of each.

Some empirical evidence

To provide some evidence on the quantity discount effect, we estimate equation (6) for a selection of loans and all deposits in domestic offices. Data on interest income/expense, number of accounts, and aggregate value for commercial and industrial loans, loans to farmers, and domestic deposit accounts are available for quarters ending in June since 1993 in the Call Reports. The Call Reports are cumulative throughout the year. Holding income/expense rates constructed as ratios of income/expense to associated account values therefore represent what the typical account of each type earned on average over the first half of the calendar year. Average account size in June can also be constructed as the ratio of aggregate account value with number of accounts for those categories of products having count information. The problem with these

data for estimating the relationship we seek is that differences in the timing of holding income/expense flows, which are cumulative, with the stocks, which are point in time at the end of the quarter. "Unit" holding income and cost rates can be therefore be rather noisy and assume rather extreme values. We therefore estimate a double log model of the form

$$\ln R = \alpha + \gamma \ln \bar{y} + \omega \ln \delta + \varepsilon \tag{8}$$

where R is the holding income in monetary units (not the rate), and $\bar{y}$ is the average account value of the associated financial product stock, and δ is given by the number of accounts.[17] This model will tend to be more resistant to extremely high and low outliers than one without the log transformation of the data.[18] The elasticity of the holding cost rate with respect to average account size is $\beta_{\bar{y}} = \gamma - 1$ and with respect to number of accounts is $\beta_z = \omega - 1$. In general, for asset interest holding income we expect $\beta_{\bar{y}} < 0$ and $\beta_z > 0$, and for liability (deposit) net holding cost we expect $\beta_{\bar{y}} > 0$ and $\beta_z < 0$, implying an *attenuating* effect on growth in output from average account size and an *augmenting* effect from number of accounts.

The variables needed to estimate equation (8) are available for Commercial and industrial loans, Loans to farmers, and Deposits in domestic offices.[19] Table 4 presents the elasticity results from such hedonic regressions. The second column gives the elasticity of the holding

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[17] Number of accounts would not ordinarily be chosen as a service characteristic indicator, so we include it as "other conditioning variables."

[18] For deposits, an unlogged model was fit for interest holding cost net of service charge income. Net holding cost can therefore assume negative values, making log transformations problematic. We therefore computed the average account size and number of accounts net holding cost elasticities at the data means and report these in Table 4.

[19] The number of accounts data for the loan categories has limited and idiosyncratic coverage, as evidenced by the very small number of banks for which these data are available. Our results can only be interpreted as suggestive of what might be obtained should more comprehensive data on number of loans become available on the Call Reports.

income rate for loans or holding cost rate for deposits with respect to the average account size, and the third column the elasticity with respect to the number of accounts. The results generally favor the quantity discount hypothesis, with exceptions for loans in certain years, but with strong confirmation for deposits.

For example, in 1993 both loan types show negative elasticities with respect to loan size. Since the user cost price for loan services, which are assets, is the holding income rate minus the reference rate, these results indicate the unmodified quantity index Q would overstate output growth during a period of growth in average loan size. The corresponding elasticity of the holding cost for deposits is strongly positive. Since the user cost price for deposits, which are liabilities, is the reference rate minus the holding cost rate, these results also indicate a downward adjustment to the growth in the quantity index Q during a period of growth in average deposit size. All products generally show positive elasticities of the user cost price with respect to number of accounts, indicating an *upward* modification to the unadjusted quantity index Q.

Concluding remarks

We have focused on the implications for economic measurement of Divisia monetary and credit aggregation, the financial firm approach to conceptualizing and compiling an output index for financial services that accounts for quality and "quantity discount" effects, and the recent change in recommendations for compiling financial services in national income accounting. We find that (1) the link between the real and monetary accounts is direct within the financial firm framework: the output index for the banking component of the financial business sector as identical with the financial stock aggregates that are the subject of central bank policy, (2) there exists an operational definition for the reference rate with an appealing conceptual interpretation that empirically gives heavier weight to sales of asset services than current U.S. imputation practice, and (3) quality adjustments for service characteristics are of two kinds: a standard

adjustment for service characteristics relating to the facilitation and convenience of transactions and intermediation, and a second adjustment relating to "quantity discounts" for services rendered on larger accounts. This second adjustment is what provides a link between the fundamentally nominal monetary and financial asset stock measures and the real output measures needed for the national accounts and compilation of real GDP. The real output measure is, we argue, an important measure for the monetary authority, since it incorporates service characteristics relating to the efficiency of the transmission of policy actions such as open market operations.

Finally we have provided some detail on the structure of the available regulatory micro-data for the U.S. banking sector, depicting, we think, the practicality of implementing the SNA FISIM-Divisia monetary aggregation-user cost financial services price measurement methodology in the U.S. We provide an initial analysis of this data source in examining calculation of the reference rate, the output index, and service quality and quantity discount adjustments to output reflecting the changing composition and pricing structure of financial services. Clearly, more could be done with the sources we identify here. We have included construction of a longer series of maturity weighted reference rates, quality adjusted gross output series using the preferred reference rate, and new estimates of final sales implied by that rate as the next group of tasks in the program we described in our introduction.

Table 1. Financial products identified in US bank regulatory data
(December 1996 Call Report)

Item number of output vector y	Maturity data?	Institutional sector?	Income/ expense Code	Asset/liability code	Description
			Assets[1]		
	Yes[2]	Yes[3]			**Loans and leases, of which**
					Loans in domestic offices
1		[4]	RIAD4011	RCON1415 +RCON1420 +RCON1797 +RCON5367 +RCON5388 +RCON1460 +RCON1480	Loans secured by real estate
2			RIAD4019	RCON1505 +RCON1517 +RCON1510	Loans to depository institutions
3			RIAD4024	RCON1590	Loans to finance agricultural production and other loans to farmers
4			RIAD4012	RCON1763 +RCON1764	Commercial and industrial loans
5			RIAD4026	RCON1756 +RCON1757	Acceptances of other banks
6			RIAD4054 +RIAD4055	RCON1975	Loans to individuals for household, family, and other personal expenditures
7			RIAD4056	RCON2081	Loans to foreign governments and official institutions
8			RIAD4503 +RIAD4504	RCON2107	Obligations (other than securities and leases) of states and political subdivisions in the U.S.

Table 1. Financial products identified in US bank regulatory data
(December 1996 Call Report)

Item number of output vector y	Maturity data?	Institutional sector?	Income/ expense Code	Asset/liability code	Description
9			RIAD4058	RCON1545+ RCON1564	All other loans in domestic offices
10			RIAD4059	RCFD2122 -RCON2122 +(RCFD2182 +RCFD2183 -RCON2165)	Loans in foreign offices, Edge and Agreement subsidiaries, and International Banking Facilities (IBFs)
11			RIAD4505 +RIAD4307	RCFD2182 +RCFD2183	Lease financing receivables
			RIAD4230	RCFD3123	*Memo: provision for loan and lease losses*
			RIAD4243	RCFD3128	*Memo: provision for allocated transfer risk*
12				RCFD2155	**Customers' liability to this bank on acceptances outstanding**
		Yes[5]			**Balances due from depository institutions**
13			RIAD4105	RCON0010	In domestic offices
14			RIAD4106	RCFD0010 -RCON0010	In foreign offices, Edge and Agreement Corporations, and IBFs
	Yes[6]				**Securities**[7]
15		Yes[8]	RIAD4027	RCFD0213 +RCFD1287 +RCFD1290 +RCFD1293 +RCFD1295 +RCFD1298	U.S. Treasury securities and U.S. Government agency and corporation obligations

Table 1. Financial products identified in US bank regulatory data
(December 1996 Call Report)

Item number of output vector y	Maturity data?	Institutional sector?	Income/ expense Code	Asset/liability code	Description
16		Yes[9]	RIAD4506 +RIAD4507	RCFD1677 +RCFD1686 +RCFD1695 +RCFD1679 +RCFD1691 +RCFD1697	Securities issued by states and political subdivisions of the U.S.
17		Yes[10]	RIAD3657	RCFD1771 +RCFD1773 -Total of items 15, 16, 18, and 19	Other domestic securities
18		Yes[11]	RIAD3658	RCFD1743 +RCFD1746	Foreign debt securities
19			RIAD3659	RCFD1748 +RCFD1751 +RCFD1753	Equity securities (including investments in mutual funds)
			RIAD3196		*Memo: Realized holding gains (losses) on available-for-sale securities*
				RCFD8434	*Memo: Net unrealized holding gains (losses) on available-for-sale securities*
				RCFD1773	*Memo: Total available for sale securities (fair value)*
			RIAD3521		*Memo: Realized holding gains on securities held-to-maturity*
				RCFD1771-RCFD1794	*Memo: Net unrealized holding gains (losses) on held-to-maturity securities*
				RCFD1771	*Memo: Total held-to-maturity securities (fair value)*
20			RIAD4069	RCFD3545	**Assets held in trading accounts**

Table 1. Financial products identified in US bank regulatory data
(December 1996 Call Report)

Item number of output vector y	Maturity data?	Institutional sector?	Income/ expense Code	Asset/liability code	Description
21	[12]		RIAD4020	RCFD0276 +RCFD0277	**Federal funds sold and securities purchased under agreements to resell in domestic offices of the bank and of its Edge and Agreement subsidiaries, and in IBFs**
				***Liabilities*[13]**	
				Produced liabilities of the bank	
					Deposits
					Deposits in domestic offices
22	Yes[14]	Yes[15]	RIAD4508	RCON2215	Transaction accounts (NOW accounts, ATS accounts, and telephone and preauthorized transfer accounts)
23	Yes[16]	Yes[17]	RIAD4509 +RIAD4511 +RIAD4174 +RIAD4512	RCON2385	Nontransaction accounts
24		Yes[18]	RIAD4172	RCFN2200	Deposits in foreign offices, Edge and Agreement subsidiaries, and IBFs
25	Yes[19]			RCFD2920	**Bank's liability on acceptances executed and outstanding**
26	Yes[20]	[21]	RIAD4180	RCFD0278 +RCFD0279	**Federal funds purchased and securities sold under agreements to repurchase in domestic offices of the bank and of its Edge and Agreement subsidiaries, and IBFs**

Table 1. Financial products identified in US bank regulatory data
(December 1996 Call Report)

Item number of output vector y	Maturity data?	Institutional sector?	Income/ expense Code	Asset/liability code	Description
			Liability items associated with obtaining capital for operations[22]		
27	Yes[23]		RIAD4185	RCON2840 +RCFD3548 +RCFD2332 +RCFD2333	**Demand notes issued to the U.S. Treasury, trading liabilities, and other borrowed money**
28			RIAD4072	RCFD2910	**Mortgage indebtedness, and obligations under capitalized leases**
29			RIAD4200	RCFD3200	**Subordinated notes and debentures**
30			RIAD4470[24]	RCFD3282	**Limited life preferred stock and related surplus**

[1] *Excluding* the following items, which are considered not to be produced assets and would therefore not appear in the bank's product vector:

Premises and fixed assets	RCFD2149
Other real estate owned	RCFD2150
Investments in unconsolidated subsidiaries and associated companies	RCFD2130
Intangible assets	RCFD2143
Other assets	RCFD2180

[2] Maturity data are available for fixed rate and floating rate (based on repricing frequency) loans consolidating domestic and foreign operations of the bank as follows:

3 months or less	RCFD0348+RCFD4554
Over three months through 12 months	RCFD0349+RCFD4555
Over one year through five years	RCFD0356+RCFD4561
Over five years	RCFD0357+RCFD4564

[3] User cost flows representing sales of real estate borrowing services originate from accounts classified according to the domicile of the borrower as

To U.S. addresses	RCFD8691-RCFD8692

To non-U.S. addresses	RCFD8692

User cost flows from other loan and lease financing receivables (except loans to individuals) represent sales to domestic business and the Rest of the world from accounts classified by borrower domicile as

To U.S. addresses	RCFD1687
To non-U.S. addresses	RCFD1689

[4] Data on the domicile of the borrower (the borrower's classification in the domestic business institutional sector or from the rest of the world) are not available for loans in domestic offices.
[5] The following domestic (financial business) and foreign (rest of world) institutional sectors are identified:

U.S. banks with U.S. banks, both their foreign (0073) and domestic (0085) branches	RCFD0073+RCFD0085
U.S. banks with banks in foreign countries and foreign central banks, including both the latter's foreign (0074) and U.S. (0083) branches	RCFD0074+RCFD0083

Service exports of the bank would be the user cost-valued service flows originating from the accounts with foreign institutions that are shown in the second row of this table.

[6] Maturity data are available for fixed rate and floating rate (based on repricing frequency) securities consolidating domestic and foreign operations of the bank as follows:

3 months or less	RCFD0343+RCFD4544
Over three months through 12 months	RCFD0344+RCFD4545
Over one year through five years	RCFD0345+RCFD4551
Over five years	RCFD0346+RCFD4552

[7] All items at fair market value.
[8] User cost flows from these instruments represent sales to Government institutional units.
[9] User cost flows from these instruments represent sales to Government institutional units.
[10] User cost flows from these instruments represent sales through mortgage-backed securities to government and quasi-governmental nonprofit agencies and corporations, such as the Government National Mortgage Association (GNMA), the Federal National Mortgage Association (FNMA), and the Federal Home Loan Management Corporation (FHLMC), as well as to undifferentiated domestic institutional units.
[11] User cost flows from these instruments represent sales to the Rest of the World.
[12] Typically of very short maturity.
[13] *Excluding* the following equity capital items, which are considered tied to the bank's title to physical and intangible capital and direct subsidiary investments:

Perpetual preferred stock and related surplus	RCFD3838
Common stock	RCFD3230
Surplus (excluding surplus related to preferred stock)	RCFD3839
Undivided profits and capital reserves	RCFD3632

Net unrealized holding gains (losses) on available-for-sale securities	RCFD8434
Net unrealized holding gains (losses) on held-to-maturity securities	RCFD1771-RCFD1794
Cumulative foreign currency adjustments	RCFD3284

The Call Report balance sheet historically costs Securities held-to-maturity and costs Securities available-for-sale at fair market value. We believe consistent treatment requires fair market value for both. This effectively adds *Net unrealized holding gains (losses) on held-to-maturity securities* (RCFD1771-RCFD1794) to the amount of Total assets calculated in the Call reports, and requires an explicit balancing counter-entry on the liability side, included above but not in the Report of Condition, complementing the similar item for Securities available-for-sale. Except for the additional item, this corresponds to the definition of equity used for regulatory purposes.

[14] Typically of very short maturity.

[15] Institutional sector detail is available as follows:

Households and nonbank business	
Individuals, partnerships, and corporations	RCON2201
Government	
U.S. Government	RCON2202
States and political subdivisions of the U.S.	RCON2203
Depository institutions (in domestic financial corporations)	
Commercial banks in the U.S.	RCON2206
Other depository institutions in the U.S.	RCON2207
Rest of the world	
Banks in foreign countries	RCON2213
Foreign governments and official institutions (including foreign central banks)	RCON2216
Sector unknown	
Certified and official checks	RCON2330

[16] Data are available for certain years prior to 1993 for fixed rate (remaining maturity) and floating rate (repricing frequency) time deposits less than $100,000 as follows:

Three months or less	RCONA225+RCONA228
Over three months through 12 months	RCONA226+RCONA229
Over one year	RCONA227+RCONA230

For time deposits of at least $100,000, data are available for the following maturities:

Three months or less	RCONA232+RCONA236
Over three months through 12 months	RCONA233+RCONA237
One year through five years	RCONA234+RCONA238
Over five years	RCONA235+RCONA239

Maturity data for deposits are quite limited in later years.

[17] Institutional sector detail is available as follows:

Households and nonbank business	
Individuals, partnerships, and corporations	RCON2346
Government	
U.S. Government	RCON2520
States and political subdivisions of the U.S.	RCON2530
Depository institutions (in domestic financial corporations)	
Commercial banks in the U.S.	RCON2550
Other depository institutions in the U.S.	RCON2349
Rest of the world	
Banks in foreign countries	RCON2236
Foreign governments and official institutions (including foreign central banks)	RCON2377

[18] Institutional sector detail is available as follows:

Households and nonbank business	
Individuals, partnerships, and corporations	RCFN2621
Government	
U.S. Government	RCFN2623
States and political subdivisions of the U.S.	RCFN2625
Depository institutions (in domestic financial corporations)	
Commercial banks in the U.S. (including IBFs and foreign branches of U.S. banks)	RCFN2650
Rest of the world	
Banks in foreign countries (including U.S. branches and agencies of foreign banks, including their IBFs)	RCFN2213
Foreign governments and official institutions (including foreign central banks)	RCFN2216
Sector unknown	
Certified and official checks	RCFN2330
All other deposits	RCFN2668

[19] Typically of very short maturity.
[20] Typically of very short maturity.
[21] Typically of very short maturity.
[22] These liability items are included only up to the value of produced assets less produced liabilities. Ideally, they would be allocated to this residual according to maturity, but lacking such information, are allocated on a pro-rata basis.
[23] Typically of very short maturity, as they are immediately callable.
[24] Pro-rata share based on share of limited life preferred stock in total preferred stock.

Table 2. Determining the Benchmark Rate
Bank Portfolio Maturity Weights by Financial Product[25]

Description	Effective Treasury security maturity	199306	199406	199506	199606
Percentages: overall loan and security portfolio					
Assets with maturity of at most 3 months		38.86%	38.55%	40.86%	40.23%
Assets with maturity of greater than 3 months and less than 1 year		15.90%	16.17%	15.98%	16.11%
Assets with maturity of greater than 1 year but less than five years		27.01%	27.08%	26.10%	25.52%
Assets with maturity greater than five years		18.23%	18.20%	17.06%	18.14%
Percentages: loan portfolio					
Assets with maturity of at most 3 months		48.64%	48.08%	49.17%	47.94%
Assets with maturity of greater than 3 months and less than 1 year		16.24%	16.20%	15.65%	16.32%
Assets with maturity of greater than 1 year but less than five years		23.62%	23.58%	23.56%	23.36%
Assets with maturity greater than five years		11.50%	12.14%	11.62%	12.37%
Percentages: security portfolio					
Assets with maturity of at most 3 months		5.52%	5.15%	4.70%	4.14%
Assets with maturity of greater than 3 months and less than 1 year		5.92%	6.13%	5.43%	4.54%
Assets with maturity of greater than 1 year but less than five years		14.04%	13.82%	10.84%	9.67%
Assets with maturity greater than five years		13.91%	12.99%	10.87%	11.10%
Treasury security interest rates					
Assets with maturity of at most 3 months	3 month	3.03	4.10	5.78	5.16
Assets with maturity of greater than 3 months and at most 1 year	6-12 mo avg	3.28	4.86	6.01	5.51
Assets with maturity of greater than 1 year and at most five years	2-3-5yr avg	4.53	6.23	6.27	6.30
Assets with maturity greater than five years	7-10-20-30 yr avg	6.16	7.21	6.77	6.85
Overall reference rate: Treasury rates averaged by maturities in FDIC portfolio		4.05	5.36	6.11	5.81
Loan reference rate: Treasury rates averaged by loan portfolio maturity weights		3.79	5.10	6.04	5.69
Security reference rate: Treasury rates averaged by security portfolio maturity weights		4.71	6.05	6.32	6.23
1-year Treasury bond rate		3.38	5.13	5.97	5.66
Unit value interest rates and user cost prices					
Annualized unit value rate: Deposit service charges		0.79	0.80	0.83	0.81
Annualized unit value rate: Deposit interest		1.96	1.69	2.46	2.46
Annualized unit value rate: Commercial and industrial loan interest		8.39	7.96	10.30	9.83
Annualized unit value rate: Loans to farmers interest		8.83	8.76	13.67	11.23
Estimated user cost price: Deposits		2.87	4.47	4.48	4.16
Estimated user cost price: Commercial and industrial loans		4.60	2.86	4.26	4.14
Estimated user cost price: Loans to farmers		5.05	3.66	7.63	5.54

[25] Source: Call reports for June quarter 1993-1996.

Table 3. Financial services quantity and price indexes[20]
Reference rate set at one-year Treasury Bond rate

Year	Asset Component of Financial Services Index (t, t-1)	Chained Asset Component Index	Liability Component of Financial Services Index (t,t-1)	Chained Liability Component Index	Chained Financial Service Output Index Q	Chained Implicit Price Index
1961	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1962	1.0665	1.0665	1.0459	1.0459	1.1154	0.9219
1963	1.0678	1.1388	1.0393	1.0869	1.2378	0.8789
1964	1.0010	1.1400	1.1028	1.1986	1.3663	0.8481
1965	1.0430	1.1889	1.0843	1.2996	1.5451	0.7852
1966	0.9738	1.1577	1.0801	1.4037	1.6251	0.7946
1967	0.9358	1.0834	1.1649	1.6351	1.7715	0.8066
1968	0.9668	1.0475	1.1374	1.8598	1.9482	0.8218
1969	0.9933	1.0405	0.9977	1.8556	1.9308	0.9448
1970	0.9526	0.9912	1.1743	2.1791	2.1599	1.0421
1971	0.9891	0.9804	1.1380	2.4798	2.4311	0.9882
1972	1.0254	1.0052	1.1387	2.8236	2.8383	0.9110
1973	1.0187	1.0240	1.1388	3.2157	3.2929	0.8724
1974	0.7872	0.8061	1.5490	4.9811	4.0152	0.8092
1975	0.9331	0.7522	1.0911	5.4351	4.0882	0.8657
1976	0.9846	0.7406	1.1014	5.9862	4.4337	1.0425
1977	1.0179	0.7539	1.1045	6.6119	4.9847	1.0276
1978	0.9985	0.7527	1.1254	7.4410	5.6011	1.0445
1979	0.9495	0.7147	1.1728	8.7271	6.2373	1.0356
1980	0.9275	0.6629	1.1555	10.0845	6.6849	1.0480
1981	0.9926	0.6579	1.1409	11.5049	7.5697	0.9713
1982	0.9763	0.6423	1.1205	12.8910	8.2805	1.0730
1983	1.0040	0.6449	1.0805	13.9287	8.9832	1.0824
1984	1.0692	0.6895	1.0636	14.8147	10.2154	1.0049
1985	1.0140	0.6992	1.0687	15.8331	11.0700	1.0830
1986	1.0350	0.7236	1.0370	16.4187	11.8813	1.0795
1987	1.0416	0.7537	1.0092	16.5701	12.4893	1.0564
1988	1.0360	0.7808	1.0198	16.8981	13.1946	1.0616
1989	1.0422	0.8138	1.0216	17.2630	14.0479	1.0385
1990	1.0317	0.8396	1.0308	17.7956	14.9407	1.0116
1991	0.9924	0.8332	1.0056	17.8958	14.9110	1.1253
1992	1.0085	0.8403	0.9974	17.8499	14.9994	1.2415
1993	1.0639	0.8940	0.9919	17.7059	15.8286	1.2617
1994	1.0532	0.9416	1.0140	17.9533	16.9040	1.1887

[20] Source: Fixler and Zieschang (1997).

Table 4. Holding Income and Cost Elasticities of Account Characteristics[21]

	199306	199406	199506	199606
Holding income and cost regression parameters, double log regressions				
Deposit interest holding cost (with CMSA fixed effects)				
Account size	0.9581	0.9596	1.0406	1.0080
Number of accounts	0.0454	0.0366	-0.0216	0.0080
Share of noninterest bearing deposits (unlogged)	-2.4905	-2.3652	-2.3641	-2.4537
Sample size	5577	5288	5015	4747
Deposit service charge income (with CMSA fixed effects)				
Account size	0.2815	0.2882	0.3118	0.2849
Number of accounts	0.6974	0.7062	0.6921	0.7414
Share of noninterest bearing deposits (unlogged)	4.4037	4.8077	4.8541	4.6684
Sample size	5422	5137	4870	4592
Commercial and industrial loan interest holding income				
Account size	0.7631	0.9662	1.0357	0.9785
Number of accounts	0.0470	0.0782	-0.0103	0.0506
Sample size	138	39	30	39
Loans to farmers interest holding income				
Account size	0.8972	0.7756	0.3914	0.7596
Number of accounts	0.0566	0.1023	0.5298	0.1883
Sample size	184	125	107	120
Holding rate elasticities with respect to average account size				
Deposit net holding cost, of which	0.414	0.556	0.410	0.364
Deposit interest holding cost	-0.042	-0.040	0.041	0.008
Service charge holding income	-0.718	-0.712	-0.688	-0.715
Commercial and industrial loan holding income	-0.237	-0.034	0.036	-0.022
Loans to farmers holding income	-0.103	-0.224	-0.609	-0.240
Holding rate elasticities with respect to number of accounts				
Deposit net holding cost, of which	-1.394	-1.558	-1.383	-1.353
Deposit interest holding cost	-0.955	-0.963	-1.022	-0.992
Service charge holding income	-0.303	-0.294	-0.308	-0.259
Commercial and industrial loan holding income	-0.953	-0.922	-1.010	-0.949
Loans to farmers holding income	-0.943	-0.898	-0.470	-0.812
User cost price elasticities with respect to average account size				
Deposits	-0.169	-0.112	-0.149	-0.144
Commercial and industrial loans	-0.432	-0.094	0.086	-0.051
Loans to farmers	-0.180	-0.537	-1.091	-0.487

[21] Source: Call Reports for June quarter 1993-1996.

Table 4. Holding Income and Cost Elasticities of Account Characteristics[21]

	199306	199406	199506	199606
User cost price elasticities with respect to number of accounts				
Deposits	0.568	0.313	0.503	0.536
Commercial and industrial loans	-1.737	-2.567	-2.444	-2.255
Loans to farmers	-1.651	-2.150	-0.843	-1.646

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