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ACTIVITY-BASED VALUATION OF BANK HOLDING COMPANIES

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ABSTRACT

Standard valuation methods do not lend themselves to bank holding companies. Banks create value through the types of assets and liabilities they create (e.g., lending and deposit taking relationships). Bank income streams reflect heterogeneous sources of income which differ in their margins of profitability and persistence. Our approach to valuation permits potential differences in the composition of assets, liabilities, income and expenses, and in the profitability and persistence of different sources of income, to reflect themselves in estimated relationships that relate the composition of the balance sheet and income statement to bank value. Our approach explains substantial cross-sectional variation in observed market-to-book values, and residuals from cross-sectional regressions of market-to-book values are useful for predicting future stock returns. Predictable future variation in returns does not reflect priced risk factors, but is related to trading costs.

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1. INTRODUCTION

Roughly 20% of the S&P 500 and Russell 3000 consist of financial services companies, with banking constituting the largest industry in this sector. Despite their importance in the stock market, there is no existing satisfactory valuation approach for banks comparable to the discounted cash flow approach used for nonfinancial firms. This study develops and tests a valuation model for Bank Holding Companies (BHCs), which is based on the cross-sectional relationship between the market-to-book ratio and proxies for the value generated by various bank activities and bank attributes. The explanatory variables are constructed using data extracted from regulatory FR Y-9C reports, which contain detailed and uniform information on the assets, liabilities, revenues and expenses of BHCs. We find that the model performs well in explaining cross-sectional differences in the market-to-book ratio, especially for large BHCs. We also find that the model's residual is strongly related to subsequent stock returns. That is, the model's inability to fully explain cross-sectional variation in the market-to-book ratio is due in part to market inefficiency rather than to model error. While the magnitude of short-term market mispricing decreases with larger bank size and greater stock liquidity, the model consistently predicts excess portfolio returns for both large and small banks. For example, of the 18 quarters examined, excess returns are positive in all 18 quarters for a portfolio of small bank stocks selected on the basis of large estimated residuals for the market-to-book ratio, and excess returns are positive in 17 of 18 quarters for a similarly constructed portfolio of large banks' stocks.

The estimated coefficients of the valuation model are generally consistent with expectations. For example, we find that persistent streams of noninterest income have larger valuation coefficients than less persistent ones. Further, the model generates reasonable estimates of the contributions of different bank activities to value. For example, the valuation coefficients

of loans average about 1.08, suggesting that investors price existing loans and related intangibles 8% above their gross book value. Similarly, the average valuation coefficient of noninterest-bearing deposits is -0.89 and that of interest-bearing core deposits is -0.92. While these coefficients likely do not capture all valuation implications of the related instruments (e.g., lending and deposit-taking activities also affect noninterest income and noninterest expense, which we account for separately), the relative magnitudes are consistent with expectations. Moreover, the estimated effects on bank value of activity-specific attributes generally have the expected signs and are significant. For example, the valuation coefficient of loans increases with average loan yield and decreases with the relative magnitudes of nonperforming loans and credit losses. Similarly, the valuation coefficient of deposits decreases (i.e., becomes more negative) with the average interest rate on deposits and increases with the relative magnitudes of transactions and savings accounts, which typically have greater "relationship" value than certificates of deposit.

Although our model is not structural in the sense that it is not based on explicit cash flow forecasting, it nevertheless allows us to compare the value contributions of different banking activities and analyze their correlations. This analysis yields many interesting insights. For example, we find that the gross value contribution of noninterest income (i.e., the present value of expected future noninterest income) is at least as large as that of loans or deposits, particularly for large firms. However, its correlation with the value impact of noninterest expense is significantly more negative than those of lending and deposit-taking activities. Thus, the *net* value contribution of noninterest income may be smaller than that of loans or deposits. Another interesting result is the strong positive correlation between the values created by loans and

deposits, which highlights the difficulty in decomposing the value of multi-dimensional customer relationships into lending and deposit-taking intangibles.

The paper proceeds as follows. The valuation model is developed in Section 2. Section 3 discusses the data, and Section 4 presents empirical results. Section 5 concludes.

2. DEVELOPMENT OF THE VALUATION MODEL

2.1 Background

When valuing non-financial service firms, most analysts first estimate the value of operations and then subtract the value of debt, typically estimated using its book value. The value of operations is calculated by discounting flow measures such as free cash flow or EBITDA, and little attention is paid to book values. In contrast, when valuing BHCs, analysts value the equity directly and often focus initially on book values. This different approach reflects the notion that banks are financial intermediaries who create value by acquiring loans and deposits on favorable terms, which increase asset returns relative to the cost of funds. For example, one approach for valuing BHCs is to start with the book value of equity and adjust it for differences between the fair and book values of selected assets and liabilities. The resulting adjusted book value is then marked up based on the perceived value of intangibles using market-to-book prices of comparable firms.

Such a valuation method is not very satisfying since it does not take into account in any systematic way the particular attributes of the subject firm's operations, and since it uses market prices of comparables to perform the valuation (making valuation extremely dependent on market prices for other firms, which may not be correct). While it may be necessary and desirable to use market values of assets in the valuation of financial institutions, such an

approach should utilize all available information about the subject firm, and should combine the information in a systematic way. Current valuation practice often falls short.

A proper approach to valuing BHCs should take into account the unique combination of features that affect the values of bank assets, liabilities, and customer relationships, and recognize the ways in which the accounting concepts used for valuing nonfinancial firms differ from those that are relevant for financial firms:

- For BHCs, operating and financing activities are intertwined, and financing activities are essential for value creation. Thus, a valuation approach that focuses on operating activities would omit a major part of value creation for banks.
- The fair values of many financial assets and liabilities of BHCs are relatively close to book values. Accordingly, balance sheet amounts can be used to value many assets and liabilities, or at least serve as a reasonable starting point for valuation.
- Reported earnings of BHCs include relatively small amounts of depreciation and other expired costs, which often have weak relation to value. Therefore, there is no need to "undo" such items from the earnings of BHCs (as is done, for example, in free cash flow or EBITDA calculations).
- BHCs are required by regulators to maintain minimum equity capital at levels proportional to their assets. This makes book equity a relatively useful measure of the scale of bank operations. Also, deviations of book capital from minimum regulatory capital reflect, inter alia, bank management of regulatory risk, which in turn reflects information about particular bank circumstances and risk management practices. Thus, the regulation of bank equity ratios enhances the statistical information contained in the levels of equity book value chosen by banks.

- BHCs' accounts provide uniquely detailed and consistent information about their assets, liabilities, revenues and expenses, which makes conditional cross-sectional analyses (such as regression analysis) more informative.

In contrast, non-financial service firms generate value primarily in operations, and the fair values of most of their assets and liabilities are substantially different from book values. In addition, for many non-financial service firms, depreciation, amortization and other expenses which measure expired costs based on rather arbitrary assumptions are relatively large, prompting analysts to use performance measures which exclude these charges (e.g., EBITDA, cash from operations). Further, the book value of equity for many non-financial service firms is small or even negative and is hardly related to market value, often rendering the market-to-book ratio a useless valuation metric. Non-financial service firms are also less regulated than BHCs and consequently their financial disclosures are less detailed and uniform than those of BHCs.

In recent years, however, some of the differences between BHCs and non-financial service firms have diminished. In particular, due to deregulation, asset securitization, technological innovations in information processing and telecommunication, development of new financial products such as credit derivatives, and other changes in the financial markets, BHCs now derive substantial portions of their income from fees and other sources of noninterest income such as investment banking, asset management and securitizations. Moreover, unlike the traditional fees that banks generate on servicing deposits and loans, which are related to investments in tangible assets, new sources of noninterest income are generated primarily by investing in human capital, technology and other intangible assets with little or no book value at

all.[1] Accordingly, a pure balance sheet approach for valuing BHCs is less appropriate today than it was in the past.

In this paper, we develop a valuation model that takes these unique aspects of contemporary BHCs into account by combining information from the balance sheet and the income statement. Our model, developed in the next sections, estimates the cross-sectional relationship between the market-to-book ratio and proxies for the value generated by various bank activities and bank attributes, where these proxies are constructed using a flexible approach that combines information from bank balance sheets and income statements.

2.2 Valuation Approach

BHCs engage in different types of activities, including generating, acquiring and servicing loans; investing in securities; trading a wide range of financial instruments on securities and futures exchanges, as well as the over-the-counter (OTC) markets; obtaining and maintaining deposits; borrowing; providing fee-based financial services (e.g., fiduciary, advisory, underwriting, brokerage, and acting as counterparties for clients in swaps and other hedges); and selling and securitizing financial assets. To a first-order approximation, the value of a BHC (*VALUE*) is the sum of the values generated in the various activities. Conceptually, the value created in activity j can be expressed as the product of the amount invested in the activity ($INVEST_j$) and the average value per dollar of investment in the activity (v_j). $INVEST_j$ and v_j typically are not directly observable. For some subset of bank activities, it is possible to use the book value of net assets engaged in the activity as a reasonable proxy for invested capital

[1] Under current U.S. GAAP, "costs of internally developing, maintaining, or restoring intangible assets (including goodwill) that are not specifically identifiable, that have indeterminate lives, or that are inherent in a continuing business and related to an entity as a whole, shall be recognized as an expense when incurred." (Statement of Financial Accounting Standard (SFAS) No. 142, *Goodwill and Other Intangible Assets*, para. 10).

($INVEST_j$), and use the profitability, risk and other characteristics of the activities as proxies for the average value per dollar invested in the activity (that is, as proxies for v_j).

In contrast, for activities that involve primarily intangible assets, it is difficult to develop measures of invested capital. We thus model the value of intangible-intensive activities based solely on their earnings stream rather than the amount and profitability of invested capital.

Our valuation model can be presented as follows:

$$VALUE = \sum_j INVEST_j \times v_j + \sum_i \gamma_i \times EAR_i \tag{1}$$

where the first summation is over all bank activities that involve primarily tangible assets and liabilities where book values serve as reasonable proxies for invested capital, while the second summation is over activities that involve primarily intangible assets. Earnings in the second summation are captured by EAR_i, where i = 1, 2, …, indexes the set of income and expense variables that are included in the model to capture the value of intangible-intensive activities, and γ_i, i = 1, 2, …, are the corresponding valuation coefficients (i.e., earnings capitalization coefficients). Dividing both sides of the equation by the book value of tangible common equity (*BOOK*), we arrive at the following expression:

$$\frac{VALUE}{BOOK} = \sum_j w_j \times v_j + \sum_i \gamma_i \times p_i \tag{2}$$

where $w_j = INVEST_j / BOOK$ and $p_i = EAR_i / BOOK$.

While bank value reflects the sum of the values generated in the various activities, it is also affected in other ways by bank attributes such as size (e.g., a “too big to fail” implicit subsidy may exist for some large banks) and by managerial factors, such as the extent of success in asset-liability management and diversification which affect bank risk and the costs of regulatory intervention. We accordingly add a third group of variables:

$$\frac{VALUE}{BOOK} = \sum_j w_j \times v_j + \sum_i \gamma_i \times p_i + \sum_l \lambda_l \times a_l \quad (3)$$

where a_l, l = 1, 2, …, represent other bank-level attributes (not captured by v_j or p_i characteristics) that may affect equity value, and λ_l are the corresponding valuation coefficients.

Our approach for modeling the value of tangible-related activities (i.e., $\sum_j w_j \times v_j$) requires that we estimate v_j—the average value per dollar investment in activity j—for each such activity. This is straightforward for activities that generate assets or liabilities with available fair values and small associated intangibles, such as investments in available-for-sale or held-to-maturity securities. For these activities we measure v_j as the ratio of reported fair value to the activity's book value. Accordingly, $w_j \times v_j$ for these activities is equal to the ratio of reported fair value to the book value of tangible common equity (the activity's book value cancels out). For other tangible-related activities, we measure w_j as the ratio of the activity's book value to the book value of tangible common equity, and we specify v_j as a linear combination of a constant and proxies for the profitability, growth and risk of the activity.[2]

The next section (Section 2.3) discusses the specific constructs we use to model the values of the various activities and the motivation for these variables. While this discussion is important for understanding how we capture the value of each activity, readers interested in skipping ahead to our empirical findings should be able to follow the presentation of our findings in Section 4 without reading Section 2.3 in advance. Section 2.4 provides a summary of the model and variables, and Appendix A details the FR Y-9C data items used in calculating each variable.

[2] An important consideration in specifying the model is to restrict the number of free parameters. Therefore, for some activities we specify v_j as a linear combination of a small number of variables or even just a constant.

2.3 The Variables

All variables are measured using information from FR Y-9C reports, which are prepared by BHCs for each calendar quarter, and include calendar year-to-date income statement, end-of-quarter balance sheet, and supplementary information.[3]

Loans and Leases

Consistent with much of the theoretical literature on value creation by banks (e.g., Diamond 1984), for many BHCs, loans and leases are the primary driver of value on the asset side. Banks' ability to generate value by investing in securities (the main alternative to loans) is limited as most securities are traded in competitive markets. In contrast, banks are often able to generate value in lending activities due to their special access to customer relationships and potential market power. Thus, the economic value of existing loans is typically larger than their book value, and this difference possibly could explain a large portion of the difference between the market and book values of equity. The value premium of existing loans reflects the effect of access to customer relationships and the ability to monitor borrowers and control their activities, which result in current and future (expected) earnings that more than compensate for the economic (risk-adjusted) cost of funding the loans. Moreover, since the value premium of existing loans increases with the strength of customer relationships, it may also proxy for expected value creation in future lending.

We model the value created in lending activities as the ratio of loans and leases to tangible common equity (w_{LOANS}) times the average value associated with a dollar investment in

[3] FR Y-9C reports are available at http://chicagofed.org/economic_research_and_data/bhc_data.cfm. These data become available about two to three months after the end of each quarter (e.g., data for the third quarter of 2004 became available at the beginning of December 2004).

loans (v_{LOANS}), which in turn is specified as a linear combination of an intercept and the following seven variables:

*The average yield on loans and leases (**YIELD**$_{LOANS}$).* All else equal, the value of existing loans and leases and the value of lending relationships increase with the loans' average yield.

*The ratio of the allowance for loan and lease losses to the gross book value of loans and leases other than those held for sale (**ALLOW**).* All else equal, the value of existing loans and leases and the value of lending relationships decrease with the loans' credit risk. On the other hand, there is a possibly offsetting effect related to the value of relationships. Firms develop relationships with bank lenders to mitigate the costs of screening and monitoring attendant to borrowing, which are higher for high-risk firms or firms with less transparent credit risks. So high risk loans may indicate more valuable lending relationships. Thus, ***ALLOW*** captures the net effect of loan risk related to allowances, less the value of relationships correlated with risk that are not captured elsewhere in the model. The allowance for loan and lease losses represents management's estimate of the amount of loans and leases held for investment that the bank will be unable to collect, based on current information and events as of the date of the financial statements.[4] Thus, the allowance-to-loans ratio should reflect the extent to which the bank's loans are at risk of not being repaid.[5]

*The ratio of nonperforming loans and leases to the gross book value of loans and leases (**NPL**).* Prior research has demonstrated that banks often manipulate the allowance for loan and lease losses, hence reducing its ability to proxy for credit risk (e.g., Beaver et al., 1989; Elliott et

[4] Loans and leases held for sale are reported at the lower of cost or fair value and therefore require no allowance.

[5] As discussed below, we include more than one measure of loan risk, which complicates the interpretation of the measured effect of the allowance-to-loans ratio.

al., 1991; Griffin and Wallach, 1991). The NPL-to-loans ratio may therefore contain incremental information about credit risk. Of course, NPLs may not be a perfect measure of portfolio risk, since banks have some discretion in measuring nonperformance (e.g., loan terms can be recast to avoid delinquency, a practice sometimes referred to as "evergreening"). To increase the comparability of NPL in the cross-section, we include in the NPL measure all loans and leases past due 90 days or more that are still accruing interest. This adjustment is important since banks differ in the delinquency periods which trigger non-accrual classification.

*Average rate of credit losses on loans and leases (**CHARGE**). ALLOW* and *NPL* reflect information about the credit risk of existing loans, but both of these measures depend somewhat on discretionary management practices for measuring loan quality and gross charge-offs. For this reason, *ALLOW* and *NPL* may not fully capture the credit risk inherent in the bank's lending activities. For example, firms that employ relatively optimistic quality measurement policies for reported loans will have low levels of *ALLOW* and *NPL*, even if their loans' credit risk is relatively large. Also, firms that use conservative charge-off policies will have low levels of *ALLOW* and *NPL*, since they remove large portions of problem loans from their books (the allowance and NPL relate to reported loans only). We therefore include *CHARGE*, the annualized ratio of net loan charge offs to average loans and leases during the quarter, as an additional proxy for credit risk.[6]

*The ratio of consumer loans to the gross book value of loans and leases (**CONSUMER**).* The rate of credit losses is typically highest for consumer loans. We therefore include *CONSUMER* to further capture the expected rate of credit losses on the loan portfolio.

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[6] Note that while gross charge-offs is affected by management discretion regarding the events that trigger charge-off, *net* charge-offs is less sensitive to variation in charge-off policies since firms that use conservative charge-off policies have large recoveries which offset the inflated charge-offs.

*The ratio of commercial loans to the gross book value of loans and leases (**COMMER**).* For most banks, the rate of credit losses on commercial and industrial loans is substantially larger than that of real estate loans. Moreover, credit losses on commercial and industrial loans are less predictable than those of most other loans, which may further reduce their value (holding constant yield and other relevant characteristics).[7]

*Annual growth in loans and leases (**$GROWTH_{LOANS}$**).* This variable is a proxy for the growth of lending opportunities, which should be positively associated with bank value. We measure the rate of growth in the gross book value of loans and leases from a year ago through the end of the current quarter.[8] To reduce the potential for outliers to drive our results, we measure all growth ratios using averages of beginning-of-period and end-of-period values in the denominator (instead of beginning-of-period values).

To sum up, we specify v_{LOANS} as follows:

$$v_{LOANS} = \alpha_1 + \alpha_2 YIELD_{LOAN} + \alpha_3 ALLOW + \alpha_4 NPL + \alpha_5 CHARGE + \alpha_6 CONSUMER + \alpha_7 COMMER + \alpha_8 GROWTH_{LOANS} \quad (4)$$

and, as discussed above, we model the value created in lending activities as the product of w_{LOANS} and v_{LOANS}.

Core Deposits

On the liability side, banks generate value primarily by obtaining and maintaining deposits which carry low or zero interest. Deposits contribute to earnings and value by reducing

[7] Banks' loan portfolios consist primarily of real estate loans (the largest group), commercial and industrial loans, and consumer loans. Other loans include loans to depository institutions, loans to farmers, loans to foreign governments and institutions, and lease financing receivables. Similar to real estate loans, these loans generally have low credit risk. We therefore treat all loans other than consumer and commercial as one group, with their average pricing being captured by the intercept of the loan value expression (equation (4) below).

[8] An alternative approach is to measure the growth in loans and leases during the current quarter. Quarter-to-quarter growth, however, may be affected by seasonality. For example, short-term commercial loans that are used to fund working capital are likely to vary over the fiscal year and across banks (so using cross-sectional regressions does not solve this problem).

banks' financing costs and creating "cross-selling" opportunities, which allow banks to generate earnings from selling non-deposit services to depositors. In most cases, the book value of deposits, which is generally equal to the amount payable on demand, overstates the economic liability attached to deposits. The contribution of deposits to bank value increases with the spread between market borrowing rates and the average interest rate on deposits, since this spread reflects the impact of deposits on net interest income (compared to the alternative of funding earning assets with capital market borrowings). The value contribution of deposits also increases with service charges, cross selling opportunities for the particular customer niche, and the stability of deposits, and it decreases with non-interest costs of servicing the deposit and the forgone interest on required reserves. These and other characteristics (e.g., deposits growth) also proxy for the future value expected to be created by deposits—the core deposit intangible—which is typically omitted from the balance sheet.[9] We accordingly model the value of the core deposit intangible combined with the value of existing deposits.

Because the average interest rate on core deposits is a primary determinant of their value contribution, we model noninterest-bearing deposits (***NONINTDEPO***) and interest-bearing core deposits (***INTCOREDEPO***) separately.[10] In both cases, similar to our modeling of the value of lending activities, we estimate the value associated with deposits and the related intangible as the product of the deposits-to-equity ratio ($w_{NONINTDEPO}$ for noninterest-bearing deposits and

[9] The core deposit intangible is recognized on the balance sheet only when the branches giving rise to this asset were purchased from other banks or in a business combination that is accounted for using the purchase method (mandatory for acquisitions consummated after 2001, under SFAS 141). Organically developed core deposit intangibles are never recognized. When recognized, the core deposit intangible is amortized to earnings over a period selected by the bank.

[10] Note that the value created from a low deposit interest rate should be measured relative to some money market benchmark interest rate. Because banks participate in the same market for such instruments, and because we control for common factors that affect all banks at any moment in time, and which are allowed to vary over time, our interest rates can be expressed in simple levels rather than as differentials with respect to a common market benchmark.

$w_{INTCOREDEPO}$ for interest-bearing deposits) and the average value associated with a dollar of deposits ($v_{NONINTDEPO}$ and $v_{INTCOREDEPO}$ respectively). If deposits do not contribute to bank value, $v_{NONINTDEPO}$ and $v_{INTCOREDEPO}$ should equal -1; if deposits add value, $v_{NONINTDEPO}$ and $v_{INTCOREDEPO}$ should be greater than -1 consistent with the economic liability attached to deposits being smaller than their book value.

Expected growth in core deposits is a primary determinant of the core deposit intangible. We use the annual rate of growth in noninterest-bearing deposits through the end of the quarter ($GROWTH_{NONINTDEPO}$) as a proxy for future growth opportunities, and accordingly model the average value associated with a dollar of noninterest-bearing deposits ($v_{NONINTDEPO}$) as follows:

$$v_{NONINTDEPO} = \beta_1 + \beta_2 GROWTH_{NONINTDEPO} \quad (5)$$

To obtain the total value associated with noninterest-bearing deposits, we multiply $v_{NONINTDEPO}$ by $w_{NONINTDEPO}$.

We model $v_{INTCOREDEPO}$ as a linear combination of an intercept and the following variables:

Average interest rate on interest-bearing core deposits ($INT_{INTCOREDEPO}$). This variable should be negatively related to $v_{INTCOREDEPO}$ for two reasons. First, all else equal, the economic liability associated with existing time deposits increases with their average interest rate. Second, the current interest rate on core deposits predicts future interest rates, which in turn affect the value of the core deposits intangible.[11]

[11] The value of the core deposits intangible is equal to the present value of net interest savings in future periods due to the use of core deposits instead of borrowed money to fund assets, plus the value added from cross-selling services to depositors, and minus the present value of cash outflows required to obtain and maintain core deposits. The latter benefits and costs are reflected primarily in noninterest income and expense, which we account for separately.

*The ratio of interest-bearing transaction accounts to interest-bearing core deposits (**NOW**), and the ratio of saving accounts to interest-bearing core deposits (**SAVINGS**).* Interest-bearing core deposits include NOW, ATS, and other interest-bearing transaction accounts, money market deposits and other savings accounts, and time deposits of less than $100,000. The average interest cost and stability of deposits, and therefore their value implications, are not identical across the various categories of deposits. Although we include the average interest cost of interest-bearing deposits as an explanatory variable, this variable is not likely to fully capture the value implications of differences in interest cost across deposit categories. For example, a bank that generated large amounts of time deposits during a period of particularly low interest rates is not likely to be able to sustain the low interest cost of deposits. In contrast, a bank that has primarily NOW accounts is likely to have persistently low interest cost. We therefore include *NOW* and *SAVING*S to capture the value implications of the composition of core deposits.

*Annual growth in interest-bearing core deposits (**$GROWTH_{INTCOREDEPO}$**).* Expected growth in core deposits affects the value of the core deposit intangible. We use the rate of growth in interest-bearing core deposits from their balance a year ago through the end of the quarter as a proxy for future growth opportunities.

To sum up, we specify $v_{INTCOREDEPO}$ as follows:

$$v_{INTCOREDEPO} = \delta_1 + \delta_2 INT_{INTCOREDEPO} + \delta_3 NOW + \delta_4 SAVINGS + \delta_5 GROWTH_{INTCOREDEPO} \qquad (6)$$

To obtain the value associated with noninterest-bearing deposits, we multiply $v_{INTCOREDEPO}$ by $w_{INTCOREDEPO}$.

Securities

Most securities are traded in relatively liquid and efficient capital markets, so banks' ability to create value by investing in securities is limited. We measure the portion of the value-

to-book ratio (the dependent variable of equation (3)) attributable to investments in securities as equal to the ratio of the fair value of investment securities to the book value of tangible common equity ($\boldsymbol{FV_{SEC}}$). This formulation posits that the contribution of marketable securities to the value of the bank is captured by the market value of those securities.

Cash and Cash-equivalent Instruments

This item includes "cash and balances due from depository institutions" and "federal funds sold and securities purchased under agreements to resell." Similar to investment securities, the ability of banks to generate value from these investments is rather limited since the market for borrowing reserves among banks is highly competitive. We measure the portion of the value-to-book ratio of equity due to cash instruments as equal to the ratio of cash and cash-equivalent instruments to the book value of tangible common equity ($\boldsymbol{FV_{CASH}}$). The assumption of market competition translates into assuming that short-term cash instruments are priced similarly across banks at the face value of the instruments (no bank makes a significant premium relative to the fed funds rate from lending fed funds).

The effect on earnings from holding reserves at the Fed at below market interest is captured elsewhere in our model, since it is directly related to the composition of deposits. Recall that banks' motive for holding reserves is largely the regulatory requirements related to deposits. Holding cash against deposits induces a cost of foregone interest income on assets held as cash. This cost of reserves is accounted for indirectly in the valuation of deposits by allowing the value of deposits to vary according to the proportion of deposits that take the form of transaction accounts (which require cash reserves).

Trading Assets and Liabilities

We measure the portion of the BHC's value-to-book ratio due to existing trading assets

and liabilities as the difference between the fair values of trading assets and trading liabilities, divided by the book value of tangible common equity ($\boldsymbol{FV_{TRADING}}$). Unlike cash and investment securities, the fair value of existing trading assets and liabilities is not likely to fully capture the value created in trading activities, since banks differ in their abilities to profit from trading. We proxy for the ability of the BHC to generate value in future trading activities by using the amount of trading revenue included in noninterest income, as discussed in detail below.

Debt Maturing or Repricing within the Next Year

This category includes the following instruments: federal funds purchased and securities sold under agreements to repurchase, domestic time deposits of $100,000 or more with a remaining maturity of one year or less, commercial paper, subordinated notes and debentures and other borrowed money with remaining maturity of one year or less, long-term debt that reprices within one year, and interest-bearing foreign deposits. For these competitively-priced instruments, book value provides a reasonable approximation of fair value. We accordingly measure the impact of these instruments on the BHC's value-to-book ratio as equal to their book value divided by tangible common equity ($\boldsymbol{FV_{STD}}$).

Fixed-rate Long-term Borrowing

We measure fixed-rate long-term borrowing as the total of domestic time deposits of $100,000 or more with a remaining maturity of more than one year, and long term debt that does not reprice within the next year. Unlike short-term borrowing, the fair value of these instruments may deviate significantly and systematically from their book value, due primarily to changes in market interest rates. We therefore model the portion of the value-to-book ratio of equity due to these instruments as equal to a cross-sectional coefficient (to be determined by the regression) times the ratio of the instruments' book value to the book value of tangible common equity

(w_{LTD}). Our model allows these cross-sectional coefficients to vary in sign and magnitude over time in response to movements in market interest rates (which affect the underlying value of long-term debts).

Other Tangible Assets

Other tangible assets are calculated as the sum of premises and fixed assets, other real estate owned, investment in unconsolidated subsidiaries and associated companies, and "other assets." Unlike financial assets (e.g., cash, loans, securities), these assets are carried on the books at amounts that may differ substantially from current market values. Moreover, these assets typically do not generate identifiable streams of income, but rather serve to reduce cash outflows or increase other sources of income. The value-creating implications of these assets will tend to be captured by other variables in our model (e.g., greater brick and mortar branches tends to attract more low-interest core deposits and high-interest loan customers, which will be captured by the proxies for core deposits and lending relationships, noninterest income flows, etc.). Thus, the valuation coefficient of other tangible assets may be substantially less than one.

Rising levels of foreclosures, which increase real estate owned, imply a similar effect. Higher real estate owned may provide a negative signal to the market about future performance, which would also tend to reduce the valuation coefficient on other tangible assets.

We specify the portion of the value-to-book ratio of equity due to other tangible assets as equal to a cross-sectional coefficient times the ratio of the book value of these assets to the book value of tangible common equity ($w_{OTHERASSETS}$).

BHCs' balance sheets also include intangible assets, including goodwill, servicing rights, favorable leasehold rights, etc. These assets are generally recognized only when acquired; under GAAP, internally developed intangibles are not reported on the balance sheet. As a result, the

book value of intangible assets is likely to be a poor proxy for their economic value. Indeed, including intangible assets in a valuation model would introduce non-comparability across banks, related to their varying experiences in mergers and acquisitions. We therefore capture the value of intangible assets (both recognized and unrecognized) using previously described variables: the characteristics of loans and deposits (which proxy for the value of lending relationships and core deposit intangibles), and measures of non-interest income and expense (which proxy for the value of intangibles used in generating fee-based income).

Other Liabilities

We measure other liabilities as the total of minority interest in consolidated subsidiaries, perpetual preferred stock and related items, net liability for acceptances, and "other liabilities." Similar to other tangible assets, we measure the portion of the value-to-book ratio of equity due to other liabilities as equal to a cross-sectional coefficient times the ratio of other liabilities to the book value of tangible common equity ($w_{OTHERLIAB}$).

We now turn to the second set of variables (the second set of terms in equation (3))—those with no available balance sheet-related proxies for the extent of bank activity, and for which valuation consequences are derived from measures of noninterest income and expense.

Noninterest Income

As discussed above, noninterest income has become increasingly important in explaining value creation for many banks. To capture this source of value, we define three measures of noninterest income, deflated by the book value of tangible common equity, which partition non-interest income based on categories that we expect will reflect different degrees of income persistence. The more persistent the income stream, the higher should be the valuation

coefficient on that income stream. By partitioning income streams according to persistence, we expect to improve the accuracy of the valuation model.

The first variable (***NONINTINC1***) includes traditional non-interest income sources: service charges on deposit accounts in domestic offices, and income from fiduciary activities. These fees tend to be highly persistent both because they are related to recurring services (e.g., monthly account fees) and because they are charged on accounts that tend to be stable (e.g., deposits). The second variable (***NONINTINC2***) includes less-traditional but generally recurring revenues such as investment banking, advisory, brokerage, and underwriting fees and commissions, insurance commissions and fees, and net income from servicing real estate mortgages, credit cards and other financial assets held by others. We also include in this variable unspecified sources of noninterest income ("other noninterest income"), because FR Y-9C instructions suggest that the items included in this category relate primarily to recurring activities. The third variable (***NONINTINC3***) includes gains and losses from activities in which banks typically generate value but which tend to be less persistent than other sources of income. These include trading revenue, venture capital revenue, net securitization income, and net gains (losses) on sales of loans and leases.

In addition to the above items, noninterest income shown in FR Y-9C reports includes net gains (losses) on sales of other real estate owned, and net gains (losses) on sales of other assets (excluding securities). These gains and losses are highly transitory so their value effect is generally captured by existing assets (e.g., the cash that was received when the gain or loss was recognized). We accordingly exclude these items from the analysis. For the same reason we also exclude realized gains and losses on held-to-maturity and available-for-sale securities.[12]

While the level of noninterest income is relevant for valuing banks, considering changes in noninterest income may provide further information. To the extent that growth in noninterest income persists, past growth in noninterest income may proxy for growth opportunities in the future. Conversely, if noninterest income exhibits mean-reversion, recent changes in noninterest income may predict future reversals. We therefore include two measures of changes in noninterest income: the change in noninterest income from the same quarter a year ago, divided by the book value of tangible common equity (***SAΔNONINTINC***), and the change in noninterest income compared to the previous quarter, divided by the book value of tangible common equity (***ΔNONINTINC***).

Noninterest Expense

Noninterest expenses are incurred in obtaining and servicing core deposits and loans, and in generating noninterest income. Failure to account for cross-sectional variation in these expenses, therefore, would result in overvaluation of core deposits, lending relationships and fee-related intangibles. For example, if two banks had the same composition of deposits, but one could achieve that composition with lower noninterest expenses related to deposit acquisition (so-called "brick and mortar costs"), then that bank would be more valuable. We define ***NONINTEXP*** as the total of salaries and employee benefits, expenses of premises and fixed assets, and "other noninterest expense," divided by the book value of tangible common equity. We exclude amortization and impairment charges because we do not include the book value of intangibles in our model, but rather focus on their earnings-generating ability. To the extent that

[12] These net gains may sometimes even be associated with negative firm performance. Many studies have demonstrated that realized securities gains and losses are used for earnings, capital and tax management (e.g., Warfield and Linsmeier, 1992; Collins, Shackelford and Wahlen, 1995), so that firms are more likely to realize gains when they have low earnings, low regulatory capital, or negative taxable income.

intangibles assets have been impaired, this will be captured in our model by the lower associated earnings stream.

Similar to our treatment of growth when measuring the effects of noninterest income above, we also include two measures that capture changes in noninterest expense: the change in noninterest expense from the same quarter a year ago, divided by the book value of tangible common equity (***SAΔNONINTEXP***), and the change in noninterest expense compared to the previous quarter, divided by the book value of tangible common equity (***ΔNONINTEXP***).

We next discuss the third and final group of variables (the third set of terms in equation (3))—attributes of the bank that may affect the bank's value incremental to the value generated by the individual activities.

Size

Large banks may be perceived to be "too big to fail" (O'Hara and Shaw, 1990; Stern and Feldman 2004). They may also have more market power (e.g., Berger, Demsetz, and Strahan, 1999), enjoy economies of scale (e.g., Sitroh, 2000; Hughes, Mester and Moon, 2001) or scope (e.g., Demsetz and Strahan, 1997), or benefit from increased diversification (e.g., Penas and Unal, 2004). Compared to small banks, large banks also may have greater financial flexibility as they may be better able to obtain capital market funds when needed (e.g., Jayaratne and Morgan, 2000). Accordingly, we control for firm size, measured using the log of total assets (***SIZE***). Since size also has implications for the value impact of the different bank activities, we estimate the model for subsamples partitioned on size.

Repricing Gap

The value of fixed-rate financial instruments is inversely related to interest rates.

Therefore, the sensitivity of the intrinsic value of equity to changes in interest rates is related to the difference between fixed-rate earning assets and fixed-rate financial liabilities. We do not have data that would permit a full analysis of the "duration gap" of each bank (that is, a measure of interest rate risk exposure of equity that is based on the Macaulay duration of bank assets and liabilities). Instead, as a proxy for the duration gap, we define ***ABSGAP*** as the absolute value of the difference between fixed-rate earning assets and fixed-rate financial liabilities, divided by the book value of tangible common equity. This variable essentially compares the magnitude of net assets exposed to interest rate risk with total net assets (i.e., common equity).

The sign of the asset-liability repricing gap may also be relevant. Many banks engage in "Carry Trade"—a strategy whereby an investor borrows at a relatively low interest rate, and then uses the proceeds to buy another asset with a higher yield, typically further out in the yield curve. In doing so, banks earn higher returns from bearing interest rate risk. Banks take advantage of this strategy by borrowing short and buying bonds, primarily mortgage-backed securities (MBS). In our modeling approach, we essentially assume that investments in securities are zero NPV activities. However, if the value impact of carry trade earnings is larger than the risk effect, banks' value-to-book ratios should increase with ***GAP***—the signed difference between fixed-rate earning assets and fixed-rate financial liabilities, divided by tangible common equity. We accordingly include this variable in the model. ***GAP*** is also relevant as a proxy for the ex post impact of interest rate exposure. For example, in periods of increasing interest rates, a positive (negative) gap implies a declining (increasing) market value of equity, and vice versa in declining interest rate environments.

Capital Adequacy

The capital position of the bank may be value-relevant for several reasons. First, BHCs

with high capital ratios pay lower FDIC insurance premiums, incur lower regulatory costs and risks, and have higher flexibility in operations and greater ability to grow.[13] Second, related to the previous point, high capital ratios may reflect accumulation of capital to facilitate value-creating growth. Capital in excess of regulatory requirements creates option value for banks by allowing them to forego having to raise external equity in the market (which would entail physical costs of underwriting, as well as adverse-selection announcement effects on the value of bank stock). Third, excess capital may proxy for market power or franchise value, since banks with greater market power may perceive that they have more to lose from regulatory intervention than other banks (e.g., Keeley, 1990), and consequently have a greater incentive to maintain excess capital. These effects suggest that the market-to-book ratio should be positively related to measures of capital adequacy. However, a possibly offsetting effect is related to the relationship between bank capital and bank risk. A high level of bank capital may indicate relatively risky operations or opaque assets (e.g., Calomiris and Wilson, 2004) which require more of a capital cushion. This effect might lead to a negative empirical relationship between capital adequacy and bank value. Moreover, higher capital could reflect the unavailability of positive net present value investments or inefficient management which fails to maximize the net benefits from leverage, which would also imply a negative relationship between capital adequacy and the market-to-book ratio.[14] Therefore, the empirical relationship between the market-to-book ratio and measures of capital adequacy is an open question. Still, the above arguments suggest that capital

[13] For example, undercapitalized banks are required to submit capital restoration plans to regulators and are subject to restrictions on operations, including prohibitions on branching, engaging in new activities, paying management fees, making capital distributions such as dividends, and growing without regulatory approval. They may even be required to dispose of assets. Some of these costs and restrictions also apply to banks that are classified as adequately capitalized, especially restrictions on growth and new operations. In general, there is probably a monotonic relationship between capital ratios and regulatory costs and restrictions.

[14] Benefits from leverage include the ability to increase the asset base (and consequently income), the tax-benefits of debt and, specific to banks, the maximization of the deposit insurance put option.

ratios may explain cross-sectional variation in market-to-book ratios and should therefore be included in our analysis.

In evaluating capital adequacy, regulators use three capital ratios: The tier 1 leverage ratio, the tier 1 risk-based capital ratio, and the total risk-based capital ratio.[15] So-called well-capitalized banks have total risk-based capital ratios, tier 1 risk-based capital ratios, and leverage capital ratios of 10, 6 and 5 percent, respectively. Accordingly, we measure capital adequacy based on what we term "deflated" ratios, that is, the ratios of each of the three capital measures relative to their respective well-capitalized benchmarks. In essence, the deflated ratios reflect the percentage deviation of the ratios from their well-capitalized benchmarks. We define ***CAP*** as the log of the minimum of the three deflated capital ratios (to capture the definition of regulatory capital that is most likely to bind on the margin), and we define ***CAP2*** as the square of *CAP*. By including both *CAP* and *CAP2* in the model, we thus allow the relationship between the market-to-book ratio and capital adequacy to be non-linear and even non-monotonic.

Dividends

Firms are reluctant to cut dividends (e.g., Lintner, 1956). Hence high dividend payments may indicate that management expects higher earnings or higher sustainability of earnings, ceteris paribus, both implying a positive relationship between the value-to-book ratio and dividend payments. We therefore include the ratio of cash dividends declared on common stock to the book value of tangible common equity (***DIV***).

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[15] The leverage ratio (tier 1 risk-based capital ratio) is calculated by dividing tier 1 capital by the quarterly average of total assets (total risk-weighted assets). The total risk-based capital ratio is calculated as the ratio of total capital to total risk-weighted assets. Tier 1 capital is measured as total equity minus some unrealized net gains, nonqualifying preferred stock and most intangibles, and plus minority interests and qualifying trust preferred securities. Total capital is equal to Tier 1 capital plus certain preferred stock and subordinated debt, a limited amount of the allowance for loan losses, some unrealized gains, and adjustment for market risk. Risk-weighted assets are the sum of balance sheet assets weighted by credit risk factors plus risk-weighted credit equivalent amounts of off-balance sheet financial instruments, and adjustment for market risk.

2.4 The Model

The dependent variable in equation (3) is the ratio of the intrinsic value of equity to its book value. Since intrinsic values are unobservable, we use market values as substitutes. This is legitimate if investors price bank stocks efficiently *on average*, in which case deviations of prices from intrinsic values are unrelated to fundamentals (in that case, pricing errors are captured and properly measured by the empirical model's estimated residuals). However, if stocks are systematically mispriced, the coefficient estimates will be biased.

Even under the assumption of market efficiency, end of quarter stock prices are not likely to fully reflect the value implications of FR Y-9C information because these reports are prepared and disseminated after the end of the quarter. To adjust for this lag, we multiply the end of quarter market value by one plus the cumulative stock return over the subsequent three months, and measure the dependent variable, *MTB*, as the ratio of this adjusted market value to the book value of tangible common equity.[16]

Our valuation model is therefore:

$$MTB = w_{LOANS} \times (\alpha_1 + \alpha_2 YIELD_{LOANS} + \alpha_3 ALLOW + \alpha_4 NPL + \alpha_5 CHARGE + \alpha_6 CONSUMER + \alpha_7 COMMER + \alpha_8 GROWTH_{LOANS}) + w_{NONINTDEPO} \times (\beta_1 + \beta_2 GROWTH_{NONINTDEPO})$$

Magnitude of loans

Value per dollar of loans

Magnitude of noninterest-bearing deposits

Value per dollar of noninterest-bearing deposits

[16] If we measure market value after the publication of the quarterly report, we may introduce error since the bank may pay dividends or issue or repurchase shares between the end of the quarter and the report publication date. Such changes in market capitalization are not directly related to the quarterly information and may therefore bias the results.

$$+ w_{INTCOREDEPO} \times (\delta_1 + \delta_2 INT_{INTCOREDEPO} + \delta_3 NOW + \delta_4 SAVINGS + \delta_5 GROWTH_{INTCOREDEPO})$$

Magnitude of interest-bearing core deposits

Value per dollar of interest-bearing core deposits

$$+ FV_{SEC} + FV_{CASH} + FV_{TRADING} - FV_{STD} + w_{LTD} v_{LTD} + w_{OTHERASSET} v_{OTHERASSET} + w_{OTHERLIAB} v_{OTHERLIAB}$$

Values of other non-intangible recognized assets and liabilities

$$+ \gamma_1 NONINTINC1 + \gamma_2 NONINTINC2 + \gamma_3 NONINTINC3 + \gamma_4 SA\Delta NONINTINC + \gamma_5 \Delta NONINTINC + \rho_1 NONINTEXP + \rho_2 SA\Delta NONINTEXP + \rho_3 \Delta NONINTEXP$$

Value of intangibles and the impact of operating costs

$$+ \lambda_1 LOGTA + \lambda_2 ABSGAP + \lambda_3 GAP + \lambda_4 CAP + \lambda_5 CAP2 + \lambda_6 DIV + \varepsilon \qquad (7)$$

Value impact of bank attributes

The free parameters in this model are: α_1 - α_8, β_1 - β_2, δ_1 - δ_5, v_{LTD}, $v_{OTHERASSET}$, $v_{OTHERLIAB}$, γ_1 - γ_5, ρ_1 - ρ_3, and λ_1 - λ_6. The observable variables are:

MTB	=	Adjusted market value of common equity (see above) divided by the book value of tangible common equity
w_{LOANS}	=	The ratio of loans and leases to the book value of tangible common equity
$YIELD_{LOANS}$	=	Annualized yield on loans and leases
ALLOW	=	The ratio of the allowance for loan and lease losses to the gross book value of loans and leases other than held-for-sale loans
NPL	=	The ratio of adjusted nonperforming loans and leases (see Section 2.3) to the gross book value of loans and leases
CHARGE	=	Annualized rate of net charge-offs on loans and leases
CONSUMER	=	The ratio of consumer loans to the gross book value of loans and

		leases
COMMER	=	The ratio of commercial and industrial loans to the gross book value of loans and leases
$GROWTH_{LOANS}$	=	Annual growth in loans and leases
$w_{NONINTDEPO}$	=	The ratio of noninterest-bearing deposits to the book value of tangible common equity
$GROWTH_{NONINTDEPO}$	=	Annual growth in noninterest-bearing deposits
$w_{INTCOREDEPO}$	=	The ratio of interest-bearing core deposits to the book value of tangible common equity
$INT_{INTCOREDEPO}$	=	Annualized average interest rate on interest-bearing core deposits
NOW	=	The ratio of NOW accounts to interest-bearing core deposits
SAVINGS	=	The ratio of saving accounts to interest-bearing core deposits
$GROWTH_{INTCOREDEPO}$	=	Annual growth in interest-bearing core deposits
FV_{SEC}	=	The ratio of the fair value of investment securities to the book value of tangible common equity
FV_{CASH}	=	The total of "cash and balances due from depository institutions" and "federal funds sold and securities purchased under agreements to resell," divided by the book value of tangible common equity
$FV_{TRADING}$	=	The difference between the fair values of trading assets and liabilities, divided by the book value of tangible common equity
FV_{STD}	=	The ratio of debt repricing or maturing within the next year to the book value of tangible common equity
w_{LTD}	=	The ratio of debt which does not reprice or mature within the next year to the book value of tangible common equity
$w_{OTHERASSET}$	=	The ratio of other tangible assets to the book value of tangible common equity
$w_{OTHERLIAB}$	=	The ratio of other liabilities to the book value of tangible common equity
NONINTINC1	=	The total of income from fiduciary activities and service charges on deposit accounts in domestic offices, divided by the book value of tangible common equity
NONINTINC2	=	The total of (1) investment banking, advisory, brokerage, and underwriting fees and commissions; (2) insurance commissions and fees; (3) net income from servicing real estate mortgages, credit cards and other financial assets held by others; and (4) "other noninterest income," divided by the book value of tangible common equity
NONINTINC3	=	The total of trading revenue, venture capital revenue, net

		securitization income, and net gains (losses) on sales of loans and leases, divided by the book value of tangible common equity
SAΔNONINTINC	=	The change in noninterest income compared to the same quarter a year ago, divided by the book value of tangible common equity
ΔNONINTINC	=	The change in noninterest income compared to the previous quarter, divided by the book value of tangible common equity
NONINTEXP	=	the total of salaries and employee benefits, expenses of premises and fixed assets and other noninterest expenses, divided by the book value of tangible common equity
SAΔNONINTEXP	=	The change in noninterest expense compared to the same quarter a year ago, divided by the book value of tangible common equity
ΔNONINTEXP	=	The change in noninterest expense compared to the previous quarter, divided by the book value of tangible common equity
SIZE	=	Log of total assets
ABSGAP	=	Absolute value of *GAP*
GAP	=	Fixed-rate earning assets minus fixed-rate financial liabilities, divided by the book value of tangible common equity
CAP	=	The log of the minimum of total risk-based capital ratio, tier 1 risk-based capital ratio, and leverage capital ratio, divided by 10, 6 and 5 percent, respectively
CAP2	=	The square of *CAP*
DIV	=	The ratio of common cash dividends to the book value of tangible common equity

3. DATA

As discussed above, we extract all accounting data from regulatory consolidated financial statements (FR Y-9C reports) that BHCs submitted to the Federal Reserve System during the period Q1:2001-Q3:2005. Under the Bank Holding Company Act, BHCs with total consolidated assets of $150 million or more, or that satisfy certain other conditions (e.g., have public debt), are required to file these reports on a quarterly basis. FR Y-9C reports contain a uniform and detailed calendar year-to-date income statement, an end-of-quarter balance sheet, and supplementary information. Approximately two and a half months after the end of each calendar quarter, the Federal Reserve

Bank of Chicago creates a SAS data file with this information for all domestic BHCs and makes it available on its web site. To create our sample, we download these files, merge them with the quarterly COMPUSTAT files (to identify the CUSIP of each company) and with the CRSP files (to obtain market and return data), and delete observations with unavailable market prices.[17]

We start the sample period in 2001 primarily because many of the variables we use (e.g., components of noninterest income) were added to FR Y-9C reports in the first quarter of 2001. Restricting the sample period to recent years is also important for accounting and economic reasons. In 2001 the FASB discontinued the pooling method for new business combinations which, given the prevalence of mergers in the banking industry, has significant implications for reported accounting numbers. In addition, under recent regulation (in particular the Gramm, Leach, Bliley Act of 1999), BHCs may engage freely in a wide range of financial activities. This deregulation has substantially changed revenue mix for many BHCs.

To reduce the effect of influential observations (outliers), we delete observations that lie outside the 0.1% to 99.9% range of the distribution for any of the variables used in the valuation model (Equation (7)).[18] The resultant sample includes a total 7,443 observations (an average of 392 per quarter). Table 1 presents summary statistics for the variables for the full sample as well as for two subsamples partitioned based on total assets (greater than or less than $1 billion). The mean (median) value of total assets is $14,706 ($1,050) million, with approximately 52% of the observations having total assets in access of $1 billion. Reflecting the very high financial leverage in the banking industry, the ratio of tangible common equity to total assets is very low

[17] To identify CUSIPs, we match the COMPUSTAT and FR Y-9C data based on bank name and financial characteristics and verify that all matches are valid and unique.

[18] We obtain results similar to those reported below when using alternative percentile cuts.

(mean 7.6%, median 7.4%), especially for large BHCs (mean/median 7.0%/6.8% compared to 8.3%/8.1% for small BHCs).

During our sample period (2001-2005), BHCs traded at book multiples (*MTB*) in excess of 2.41, on average. Large BHCs had especially large book multiples, with mean (median) market-to-book ratio of 2.88 (2.67) compared to 1.93 (1.82) for small BHCs. The higher book multiples of large BHCs coincide with substantially higher leverage and noninterest income. Large BHCs' higher leverage ratios allow them to generate more loans for each dollar of book value (mean (w_{LOANS}) = 9.74 for large BHCs compared to 8.82 for small BHCs). Large BHCs also have larger investments in securities per dollar of book value (mean (FV_{SEC}) = 3.76 for large BHCs compared to 2.82 for small BHCs). These incremental investments in loans and securities by large BHCs are funded primarily by short-term debt (mean (FV_{STD}) = 3.29 for large BHCs compared to 1.98 for small BHCs). Large BHCs also have higher long term debt-to-equity ratios (mean (w_{LTD}) = 1.36 for large BHCs compared to 1.09 for small BHCs).[19] In contrast, the deposits-to-equity ratios ($w_{NONINTDEPO}$ and $w_{INTCOREDEPO}$) of large BHCs are generally comparable to those of small BHCs which, given the differences in equity-to-assets ratios, implies that large BHCs have substantially smaller deposits-to-assets ratios.

Examination of the distributions of the noninterest income variables reveals substantial differences between large and small BHCs. Large BHCs generate mean noninterest income of 6.3% (= 2.5% + 2.9% + 0.9%) of common equity each quarter, which is much larger than that of small BHCs (3.7% = 1.4% + 1.6% + 0.7%). This difference in noninterest income is only partially offset by noninterest expense (a mean of 11.7% for large BHCs compared to 10.5% for

[19] A comparison of w_{LTD} with FV_{STD} reveals that banks have substantially less fixed-rate long-term debt than short-term (or variable rate) debt. This is consistent with Calomiris and Kahn (1991) and Flannery (1994) who suggests that banks incur particularly large agency costs of debt and so issue short-term or repricable debt to mitigate these costs.

small BHCs). Thus, even a simple analysis of summary statistics suggests a connection between the high market-to-book ratios of large BHCs and their relatively large magnitudes of loans and noninterest income. Indeed, in the next section we demonstrate that loans and noninterest income explain significant portions of the cross-sectional variation in market-to-book ratios.

4. EMPIRICAL TESTING OF THE VALUATION MODEL

4.1 Explaining Market Valuations

Table 2 presents summary statistics from nineteen separate cross-sectional quarterly regressions of equation (7) for the period Q1:2001-Q3:2005. For each coefficient, we report the time-series mean across the regressions, its t-statistic, the median, and the lower and upper quartiles. To mitigate the effect of potential auto-correlation in the estimated coefficients, the t-statistics are calculated assuming the quarterly coefficients follow an AR(1) process over time. In addition to the coefficient estimates, we use equations (4), (5) and (6) to calculate the cross-sectional mean values of v_{LOANS}, $v_{NONINTDEPO}$ and $v_{INTCOREDEPO}$, respectively, and we report summary statistics for these quantities as well (recall that "v" denotes average value per dollar book value of the subscripted asset or liability). The last four columns report the time-series means and t-statistics when the regressions are estimated for two subsamples: large BHCs (total assets > $1 billion) and small BHCs (total assets < $1 billion).

The average number of observations per quarterly regression is 202 for large banks, 189 for small banks, and 392 for all banks. The variation over time in the number of observations is relatively small. Thus, although the number of estimated parameters is quite large—32 per regression—in each of the regressions there are more than 5 observations per parameter. The R^2 is consistently high, especially for large BHCs (the average R^2 is 0.757 for large banks,

compared to 0.561 for small banks). The larger R^2 for large banks could reflect a number of differences, including the impact of greater risk diversification, which could increase the persistence of value drivers and accordingly improve the regression's ability to capture value. Overall, the models perform well in explaining value. We now turn to discuss the coefficient estimates.

As expected, the value of loans increases with the average yield (α_2), especially for large BHCs. Consistent with prior research (e.g., Beaver et al., 1989) the loan loss allowance (α_3) does not subsume the information about credit risk contained in nonperforming loans (α_4) and loan charge-offs (α_5). In fact, the allowance coefficient is insignificant, while the coefficients on nonperforming loans and loan charge-offs are highly significant. Similar to the loan-yield coefficient, the magnitudes of the credit proxy coefficients are substantially larger for large BHCs, especially the loan charge-offs coefficient.

Holding constant the average yield and credit risk of loans, consumer loans (α_6) are less valuable than other loans. This could be due to their shorter maturity. Unfortunately FR Y-9C reports provide no information on loan maturity, so we cannot incorporate this characteristic into our model. Note, however, that since the average yield on consumer loans is higher than that of other loans, the unconditional value of consumer loans is not necessarily smaller than that of other loans. The remaining loan variables are less important: the commercial loans coefficient (α_7) is insignificant, and the loan growth coefficient (α_8) is only marginally significant.

The v_{LOANS} statistics suggest that the average value of loans is about 7-8 percent above their gross book value. To the extent that expected value creation in future lending is correlated with value creation in past lending, v_{LOANS} may also capture the value of lending-related intangibles. However, v_{LOANS} does not reflect any value due to cross-selling (e.g., taking

borrower deposits, earnings noninterest income by providing services to borrowers), which are captured separately. More importantly, v_{LOANS} does not reflect the noninterest expense that banks incur in generating and servicing the loan portfolio. The value impact of cross-selling and noninterest expense is captured primarily by the noninterest income and expense variables discussed below.

As expected, the economic liability attached to noninterest-bearing core deposits is substantially smaller than their book value (about 89 cents per dollar of book value), reflecting a substantial gross value premium associated with deposits. Similar to the loans coefficient, however, this estimate of the gross deposit value premium does not reflect the costs associated with obtaining and servicing deposits, nor does it reflect the service charges earned on deposits or the value of cross-selling opportunities that deposits create.[20] Similar to the loan growth coefficient, the coefficients of the deposit growth variables (β_2 and δ_5) are only marginally significant. The low significance of the growth variables could be due to the fact that growth is often driven by acquisitions rather than internal investments. The signs of the coefficients on the other attributes of interest-bearing deposits are as expected. Similar to loans, the interest rate variable (δ_2) is particularly important.

The coefficients on long-term debt are close to one, suggesting that long-term borrowing is a zero NPV activity for banks. The magnitudes of the coefficients on "other liabilities" and "other assets" are significantly smaller than one, consistent with fact that these items generate no income streams directly, but instead contribute to the value of other activities (which are

[20] An interesting extension of this study would be to supplement model (7) with equations that quantify the impact of loans and deposits on noninterest income and noninterest expense, and derive the total (direct and indirect) value of loans and deposits.

accounted for separately). For example, as noted before, the *net* valuation of deposits partially reflects the impact of branches, which are included in "other assets."

The noninterest income level variables are all positive and highly significant, with relatively persistent streams having larger valuation coefficients than less persistent ones. In contrast, the measures of change in noninterest income have negative coefficients, suggesting that the effect of mean-reversion in noninterest income outweighs the long-term growth projections derived from short-term growth. Mean reversion is also the dominant effect for the measures of change in noninterest expense. Similar to noninterest income, the magnitude of the coefficient on the level of noninterest expense is large, suggesting that this variable is highly persistent.

Considering the last set of variables—bank attributes—we observe that bank size (λ_1) and the dividend ratio (λ_6) are both positive and highly significant. The signed gap (***GAP***) has a highly significant positive coefficient (λ_3), consistent with banks benefiting from engaging in the carry trade strategy (see the discussion in Section 2.3). In contrast, the coefficient on *ABSGAP* (λ_2)—our measure of the magnitude of interest rate sensitivity—is insignificant.

The relationship between the market-to-book ratio and regulatory capital is particularly interesting—it is U-shaped with a minimum close to the 90^{th} percentile of the distribution of *CAP*. That is, for most banks the relationship between value and capital is negative, perhaps because banks with low regulatory capital also have lower asset risk (e.g., Calomiris and Wilson, 2004). In contrast, when regulatory capital is high, the relationship between value and capital becomes positive, consistent with the arguments for a positive value of excess regulatory capital discussed in Section 2.3 (e.g., reflecting a valuable real option to expand operations). Thus, there

is evidence of the potential importance of various opposing valuation effects from greater capital adequacy.[21]

4.2 Value Creation by Activity

Equation (7) models the market-to-book ratio as the sum of values associated with various banking activities, divided by the book value of equity. If we subtract from the value of each activity the book value of net assets invested in that activity, we can re-express equation (7) as explaining the market premium over book value (i.e., $MTB - 1$) using measures of value creation by each activity (i.e., value in excess of book investment). Specifically,

Value contribution of loans $= w_{LOANS} \times v_{LOANS} - w_{LOANS} =$

$$w_{LOANS} \times (\alpha_1 + \alpha_2 YIELD_{LOANS} + \alpha_3 ALLOW + \alpha_4 NPL + \alpha_5 CHARGE + \alpha_6 CONSUMER + \alpha_7 COMMER + \alpha_8 GROWTH_{LOANS} - 1)$$

Value contribution of noninterset-bearing deposits $= w_{NONINTDEPO} \times v_{NONINTDEPO} + w_{NONINTDEPO} =$

$$w_{NONINTDEPO} \times (\beta_1 + \beta_2 GROWTH_{NONINTDEPO} + 1)$$

Value contribution of interest-bearing core deposits $= w_{INTCOREDEPO} \times v_{INTCOREDEPO} + w_{INTCOREDEPO} =$

$$w_{INTCOREDEPO} \times (\delta_1 + \delta_2 INT_{INTCOREDEPO} + \delta_3 NOW + \delta_4 SAVINGS + \delta_5 GROWTH_{INTCOREDEPO} + 1)$$

Value contribution of noninterest income =

$$\gamma_1 NONINTINC1 + \gamma_2 NONINTINC2 + \gamma_3 NONINTINC3 + \gamma_4 SA\Delta NONINTINC + \gamma_5 \Delta NONINTINC$$

Value contribution of noninterest expense =

$$\rho_1 NONINTEXP + \rho_2 SA\Delta NONINTEXP + \rho_3 \Delta NONINTEXP$$

Recall that the "v" terms measure value per dollar invested in the related activity, while the "w" terms reflect the amount invested in the activity relative to the book value of equity. Since the book values of deposits represent negative investments, we add rather than subtract the related w

[21] In future work, we plan to examine the valuation effects of capital adequacy in a framework that estimates the consequences of capital structure for both market-to-book values and bank risk.

terms. For noninterest income and expense, no such adjustment is required since we do not associate book values of assets or liabilities with these items (the book values of non-financial assets and liabilities are accounted for separately). We further define "other explained" as equal to that portion of the fitted premium (i.e., fitted value of equation (7) minus one) associated with activities other than loans, deposits, noninterest income and noninterest expense. Finally, we define "unexplained" as the residual of equation (7).

Panel A of Table 3 provides summary statistics from the distributions of the values created by the above activities per dollar of equity book value. We report two measures of central tendency (mean and median) and two measures of dispersion (standard deviation and inter-quartile range). As discussed in Section 4.1, large BHCs have higher leverage and larger noninterest income compared to small BHCs. Consequently the contributions of essentially all activities to the market-to-book ratio are larger for large BHCs compared to small BHCs. Therefore, to identify differences in the relative importance of the different activities across the size-based subsamples, we report in panel B the standardized value contributions, calculated by dividing each column of Panel A by the corresponding sum of components. The primary contributors to the cross-sectional variation in the market-to-book ratio are the following activities (in order of importance): noninterest expense, noninterest income, loans, and interest-bearing deposits. Noninterest-bearing deposits have a relatively small effect, especially for large BHCs. The value impact of noninterest income is particularly high for large BHCs, explaining about twice as much of the market-to-book variation compared to interest-bearing deposits. In contrast, for small BHCs, loans and noninterest-bearing deposits are more important than noninterset-income in explaining value creation.

Table 4 presents the correlation coefficients (both Pearson and Spearman) between the estimates of value creation by the various activities for all BHCs (Panel A) as well as for the two size-based subsamples (Panels B and C). Most notable are the correlations between the value impact of noninterest income and noninterest expense. These correlations, which range between -0.81 and -0.64, suggest that noninterest expense is largely driven by strategies to boost noninterest income, which would imply that the *net* value impact of noninterest income is substantially smaller than implied by the estimates of Table 3.

The value impact of noninterest expense is also negatively related to those of loans and deposits, suggesting that the estimates of the gross value impact of loans and deposits in Table 3 are overstated as measures of *net* impact. However, for deposits there is a favorable offsetting correlation with noninterest income; that is, while deposit-taking involves expenditures that are reported as noninterest expense, it is also associated with noninterest income. Accordingly, the estimated gross valuation coefficients for deposits do not necessarily overstate their value implications.

Another interesting set of correlations are those between the value creation of loans and deposits. These correlations are significantly positive, consistent with the fact that lending and deposit-taking are related activities which are often conducted with the same customers. Thus, decomposing the value of customer relationships into lending and deposit-taking intangibles is a difficult task. Any estimates that attempt to do so by ignoring the high correlation between the two are likely to be quite unreliable.

The primary differences between the correlations for the two size-based subsamples are related to the behavior of noninterest income. For small banks noninterest income is strongly related to the value created by deposit-taking and lending activities, while for large banks the

correlations are smaller and, in fact, negative for loans. Also, for small banks lending and deposit-taking activities exhibit much stronger correlations with non-interest expense compared to large BHCs.

4.3 Predicting Stock Returns

The results in Table 2 indicate that equation (7) performs well in explaining cross-sectional differences in the market-to-book ratio, as reflected in the relatively high R-squared measures. Yet the root mean squared errors (RMSE) from the cross sectional regressions are far from negligible: both the mean and median cross-sectional RMSE are about 0.57, suggesting that for approximately 32 percent of the observations the magnitude of the valuation error is more than 57% of book value. Alternatively, the regression residual may partially reflect market mispricing; that is, the prices of some stocks may deviate from intrinsic values. In particular, relatively large residuals may be due to cases where investors misprice bank attributes. If this explanation holds, the residuals from model (7) should predict subsequent stock returns. We next test this hypothesis.

For each quarter we calculate the predicted market-to-book ratio for each bank, multiply it by the bank's tangible common equity to obtain an estimate of the bank's value, and then divide this estimate by the bank's market value. To the extent that valuation model (7) captures value that investors ignore, banks with high (low) predicted value-to-market ratios (*VTM*) should experience subsequent price increases (declines). To test this hypothesis, we perform portfolio and regression analyses, which examine the ability of *VTM* to predict subsequent stock returns. The results of these analyses are presented in Tables 5 and 6, respectively.

Table 5 reports the time-series means and t-statistics of excess future returns for six portfolios: the first five are constructed by sorting stocks into quintiles based on the *VTM* ratio, while the sixth portfolio is long in the high *VTM* portfolio and short in the low *VTM* portfolio. Excess returns are measured relative to the contemporaneous equally-weighted return on all bank stocks. The return accumulation period starts three months after the end of the quarter, and continues for one, two, three, or four quarters. To mitigate the effect of auto-correlation in returns, the t-statistics are calculated assuming the portfolio returns follow an ARMA(1,q-1) process, where q is the number of quarters in the return period.[22] Panel A presents the results using the full sample, while Panels B and C provide the returns to the long-plus-short combined investment strategy when the analysis is conducted using only large (Panel B) or small (Panel C) BHCs.

In all cases, the predicted value-to-market ratio is strongly related to subsequent stock returns: banks with low *VTM* have highly significant negative subsequent excess returns, while banks with high *VTM* have positive subsequent returns. The pattern of excess returns suggests that it takes at least four quarters for prices to converge to predicted values. The average returns to the long-plus-short investment portfolios for the first subsequent quarter are 4.4% when using all firms, 3.1% when focusing on large firms, and 5.5% for small firms. The corresponding annualized returns are 18.8%, 13% and 23.9%, respectively. Moreover, as shown in Figure 1, these returns are earned quarter-after-quarter, suggesting that they are unlikely to represent compensation for risk.

To more directly address the possibility that these excess returns reflect priced risk, we control for risk factors by running cross-sectional regressions of the following model:

[22] The auto regressive parameter controls for autocorrelation due to firm effects. The moving average parameters control for overlapping returns in the two, three and four quarters horizons.

$$RET = \eta_1 + \eta_2 VTM + \eta_3 BTM + \eta_4 LOGMV + \eta_5 \beta_{market} + \eta_6 abs(\beta_{interest}) + \eta_7 abs(\beta_{slope}) + \eta_8 \beta_{spread} + \eta_9 VOLAT + \varepsilon \quad (8)$$

where, similar to the previous analysis, the stock return (*RET*) is measured over horizons of one to four quarters, *BTM* is the book-to-market ratio of common equity, *LOGMV* is the log of the market value of common equity, the beta variables are estimates of stock return sensitivities to relevant risk factors, and *VOLAT* is an estimate of idiosyncratic stock volatility. We estimate the beta variables by regressing excess monthly stock returns during the sixty months ending in the valuation quarter on excess market return (*market*), the monthly change in the one-year U.S. Treasury bill (*interest*), the monthly change in the slope of the term-structure (*slope*, the difference between the yields on 10 and 1 year U.S. Treasury bond/bill), and the monthly change in the market credit spread (*spread*, the difference between Moody's AAA and BAA Corporate bond yields). "abs(.)" denotes the absolute value function. *VOLAT* is measured as the root mean squared error from the beta regression.

The risk controls in Model (8) are generally based on prior studies (e.g., Barber and Lyon, 1997). We use the absolute value of $\beta_{interest}$ since investors may demand a risk premium for holding the stocks of both asset-sensitive and liability-sensitive banks (compared to zero-gap banks). Similarly, we use the absolute value of β_{slope} since investors may require a risk premium for exposure to both increases and decreases in the slope of the yield curve. In contrast, expected returns are likely to be monotonically related to the market and credit spread betas, since opposite sensitivities (negative for market, positive for spread) may allow investors to reduce these risks at the portfolio level. In any case, we rerun all analyses using the signed values of $\beta_{interest}$ and β_{slope} and obtain similar results for *VTM*, the variable of interest. Note that while the expected signs of β_{market}, $abs(\beta_{interest})$ and $abs(\beta_{slope})$ are positive (higher sensitivity implies higher

risk), that of β_{spread} is negative (less negative β_{spread} implies lower sensitivity to a credit spread widening).

Because many BHCs do not have the five years of previous stock returns required to measure the beta and volatility variables, we first estimate a model that excludes these variables. Table 6 presents the regression statistics: Panel A for all firms, Panel B for large banks, and Panel C for small banks. Panel D gives the estimates for the full model using all firms with available data. Similar to the excess return statistics in Table 5, the t-statistics are calculated assuming the cross-sectional coefficients follow an ARMA(1,q-1) process, where q is the number of quarters in the return period. In all sixteen sets of cross sectional regressions, the coefficient on *VTM* is positive and highly significant, confirming that our model captures market mispricing rather than priced risk.

Considering the full model, the estimated coefficients of the risk controls are only partially consistent with expectations. The only coefficient which is consistently significant is that of *LOGMV* (negative relation). In some of the regressions, the coefficients of β_{spread} and *VOLAT* are as expected—significantly negative and positive, respectively. However, in other regressions these coefficients are insignificant. In addition, the coefficients of *BTM*, β_{market}, and $abs(\beta_{interest})$ are insignificant. In contrast to expectations, the abs(β_{slope}) coefficient is significantly negative in some of the regressions. Interestingly, the coefficient of *BTM* is positive for large firms but negative for small firms (Panels B and C respectively). One possible explanation for this result is that investors in small banks over-emphasize the importance of book value as a measure of equity value, and this mispricing effect is larger than any priced-risk effect associated with the book-to-market ratio. In contrast, market prices of large banks, while not fully efficient, reflect a larger information set than book value.

Comparing the magnitude of excess returns (in Table 5) and the *VTM* coefficients (in Table 6) across the size-based subsamples, we observe that both quantities are negatively related to size. Since small firms are more likely to be inefficiently priced compared to large firms, this result is consistent with the model capturing mispricing rather than compensation for risk. In Section 4.4 below we further investigate the relationship between mispricing and proxies for information processing, liquidity and transaction costs.

4.4 Explaining Stock Return Predictability

"Neglected," illiquid or high transaction cost stocks are more likely to be mispriced compared to other stocks. Thus, if our *VTM* strategy indeed captures mispricing rather than compensation for risk, BHCs with extreme values of *VTM* are likely to be those that are overlooked by investors and financial analysts, and their stocks may be more likely to have low liquidity and high transaction costs compared to other BHCs (which may explain why they are overlooked by investors). We use the following proxies to examine the explanatory power of differences in investor attention, liquidity and transaction costs: analysts following (*AF*), institutional ownership (*IO*), size (*LOGMV*), price per share (*LOGP*) and turnover (*TURN*). *AF* is the number of EPS forecasts for the current year reported by IBES in the last month of the quarter. *IO* is measured as the fraction of the BHC's outstanding shares held by large institutional investors at the end of the quarter.[23] *LOGP* is the log of the BHC's share price at the end of the quarter. *TURN* is the logarithm of the average ratio of the stock's monthly trading

[23] Large institutions are those with more than $100 million of securities under discretionary management, which are subject to the 13(f) reporting requirements. Institutional ownership information is obtained from Thomson Financial Securities Data.

volume to total shares outstanding during the twelve months ending at the end of the quarter. Our regression model is therefore

$$MISPRICING = \lambda_1 + \lambda_2 AF + \lambda_3 IO + \lambda_4 LOGMV + \lambda_5 LOGP + \lambda_6 TURN + \varepsilon \qquad (9)$$

where MISPRICING is the absolute value of ($VTM - 1$).

Table 7 presents summary statistics from cross-sectional regressions of model (9) for three samples: all BHCs, and each of the two size-based subsamples. When using all BHCs, the coefficients of three of the explanatory variables have their expected sign and are significant: analysts' following, size and turnover, with turnover being particularly significant (t-statistic = -15.9). In contrast, price per share is insignificant, and institutional ownership has the opposite sign. The results for the two subsamples reveal an interesting pattern. For large BHCs, *LOGMV* is insignificant and the primary explanatory variable is turnover (t-statistic = -10.5). In contrast, for small BHCs *LOGMV* is the most significant explanatory variable (t-statistic = -15.0) and turnover is only marginally significant. Also, for small BHCs *AF* switches sign, and the average R-squared are substantially larger than for large BHCs.

Overall, these results provide limited support for the hypothesis that mispricing is larger for neglected, illiquid or high transaction cost stocks. The observed differences between results for large and small banks suggests that investor attention depends on the absolute amount of shares available for trading, not the ratio of shares actively traded. For small BHCs, even when turnover rates are high, the bank is too small to attract investor interest. For larger BHCs, they can attract investor interest so long as their stocks are traded with sufficient frequency.

5. CONCLUSION

Standard methods for valuing nonfinancial firms do not lend themselves to the valuation

of bank holding companies, due to fundamental differences between the structures and functions of financial intermediaries and nonfinancial firms. Debt is not just a financing source for banks; when it takes the form of deposits it is one of the value drivers of the banking franchise. For nonfinancial firms, EBITDA or some related measure of operating income is used to measure current and prospective cash flows. But income streams of banks do not lend themselves to this approach, since bank income flows from differing sources of interest income, noninterest fee income, and trading income, which differ in their margins of profitability and in their persistence.

Our approach to valuation begins by dividing all available information about income and expenses into separate categories that permit potential differences in profitability margins and persistence across categories to reflect themselves in different coefficients that relate a dollar of income (within a particular category) to firm value. Our approach also makes use of book asset and liability data for selected activities. We argue, on a priori grounds, that such balance sheet data should be useful for measuring net investment for some categories of bank activities, and market value for some categories of tradable assets.

Our valuation model focuses on the value-to-book ratio, which we argue is a natural way to approach the valuation of banks. The model generally does not impose coefficient values, but rather estimates them under the assumption that, at each moment in time, the *average* empirical relationships between income categories and firm value are reflected in observed market-to-book values. Our results are promising in the sense that this approach explains a substantial amount of the cross-sectional variation in observed market-to-book values.

Bank holding companies that have lower (higher) than predicted market-to-book ratios within the quarter in which we estimate the model tend to experience large, statistically significant, predictable increases (decreases) in market values in subsequent quarters.

We investigate whether the predictable changes in stock prices reflect priced risk factors and find that they do not. Even when we use a multifactor model of risk pricing, residuals from our estimation of market-to-book value still retain their importance for forecasting future returns.

We also investigate whether predictable returns reflect trading costs, and we find limited evidence consistent with this view. Specifically, firms with small amounts of tradable shares in the market place (due to a combination of small size and low ratio of volume relative to outstanding shares) tend to experience large predictable positive and negative returns using our valuation model.

One interesting finding from our model is the U-shaped relationship between capital position and firm value. For some range of capital ratios, lower leverage is associated with higher value, reflecting perhaps the real option value of excess capital. However, for most levels of capital ratios, higher leverage is associated with higher value, suggesting that some banks are able to maintain higher profitability through greater leveraging without generating commensurately higher risk. In other words, superior risk management may be an important value driver for banks. Future work should simultaneously model bank value and bank risk management to further elucidate the connections between endogenous choice of leverage and value creation.

Appendix A
FR Y-9C Data Items

This appendix reports the specific data items used in calculating the variables. Since the analysis uses quarterly measures of performance, while FR Y-9C reports provide year-to-date income statement data, we adjust the reported revenues and expenses in the second, third and fourth calendar quarters by subtracting the previous quarter values of these variables. We indicate this adjustment by adding the word 'quarterly' to the respective data items.

Tangible common equity = total equity capital (BHCK3210) - perpetual preferred stock and related surplus (BHCK3283) - intangible assets (BHCK3163 + BHCK0426)[24].

Relative size of loans and leases (w_{LOANS}) = loans and leases including loans held-for sale and before deducting the allowance for loan and lease losses (BHCK2122), divided tangible common equity.

Average yield on loans and leases ($YIELD_{LOANS}$) = the annualized ratio of tax-equivalent interest and fee income on loans and leases (quarterly BHCK4010[25] + quarterly BHCK4059 + quarterly BHCK4065[26] + tax-equivalence adjustment) to the reported average balance of loans and leases during the quarter (BHCK3516).[27] The tax-equivalence adjustment is calculated as the product of income on tax-exempt loans and leases (quarterly BHCK4313[28]) and the ratio of the corporate top statutory federal tax rate (0.35 for our sample period) to one minus the tax rate. The yield is annualized using a compound interest calculation.

Allowance-to-loans ratio (ALLOW) = the ratio of the allowance for loans and lease losses (BHCK3123) to the balance of loans and leases excluding loans held for sale and before deducting the allowance (BHCK2122 – BHCK5369).

NPL-to-loans ratio (NPL) = the total of nonaccrual loans and leases (BHCK5526 – BHCK3507), accruing restructured loans and leases (BHCK1616), and loans and leases past due 90 days or more and still accruing interest (BHCK5525 – BHCK3506)[29], divided by loans and

[24] Prior to 2001, intangible assets were equal to the total of BHCK316, BHCK3164, BHCKB026 and BHCK5507.

[25] Prior to 2001, this item was equal to the sum of BHCK4393, BHCK4503 and BHCK4504.

[26] Prior to 2001, this item was equal to the sum of BHCK4505 and BHCK4307.

[27] The average balance of loans and leases during the quarter is based on daily or weekly averages, as selected by the BHC. It includes loans held for sale and is measured net of unearned income and gross of the allowance for loan and lease losses.

[28] Prior to 2001, this item was equal to the sum of BHCK4504 and BHCK4307.

[29] Nonaccrual loans are loans on which interest accruals have been discontinued due to borrowers' financial difficulties. Typically, loans are placed on non-accrual status once interest or principal payments are delinquent for a specified number of days (e.g., 90 or 120 days past due). A loan is considered restructured when the bank for economic or legal reasons related to the debtor's financial difficulties grants a concession to the debtor that it would not otherwise consider.

leases including loans held-for sale and before deducting the allowance for loan and lease losses (BHCK2122).

Annualized rate of net charge-offs on loans and leases (CHARGE) = the annualized ratio of net loan charge offs to average loans and leases during the quarter (BHCK3516). Net loan charge offs are calculated as loan charge offs and write-downs arising from the transfer of loans to the held-for-sale account (quarterly BHCK4635) minus loan recoveries (quarterly BHCK4605). The rate is annualized using a compound interest calculation.

Consumer loans-to-loans ratio (CONSUMER) = the ratio of consumer loans (BHCKB538 + BHCKB539 + BHCK2011)[30] to loans and leases including loans held-for sale and before deducting the allowance for loan and lease losses (BHCK2122).

Commercial loans-to-loans ratio (COMMER) = the ratio of commercial and industrial loans (BHCK1763 + BHCK1764) to loans and leases including loans held-for sale and before deducting the allowance for loan and lease losses (BHCK2122).

Noninterest-bearing deposits (NONINTDEPO) = domestic demand deposits (BHCB2210) + other domestic noninterest-bearing balances (BHOD3189) + noninterest-bearing foreign deposits (BHFN6636).

Interest-bearing core deposits (INTCOREDEPO) = NOW, ATS, and other interest-bearing transaction accounts (BHCB3187 + BHOD3187) + money market deposits and other savings accounts (BHCB2389 + BHOD2389) + time deposits less than $100,000 (BHCB6648 + BHOD6648).[31]

Average interest rate on core deposits = annualized ratio of interest expense on core deposits (quarterly BHCKA518 + quarterly BHCK6761) to the average of the beginning- and end-of-quarter balances of interest-bearing core deposits.[32]

Fair value of investment securities = fair value of held-to-maturity (BHCK1771[33]) + fair value of available-for-sale securities (BHCK1773).[34]

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[30] Prior to 2001, BHCKB538 and BHCKB539 were reported combined as BHCK2008.

[31] Ideally, we would also like to exclude brokered time deposits from the definition of core deposits. However, FR Y-9C reports do not provide a breakdown of interest expense for brokered versus non-brokered deposits, which is the primary characteristic that we use to model the value of core deposits.

[32] Ideally, we would like to use daily or weekly averages. Unfortunately, FR Y-9C reports do not provide the average balance of core deposits.

[33] Prior to 2001, this item was named BHCK8551.

[34] Under SFAS 115, investments in debt and equity securities (other than equity securities that do not have readily determinable fair values or that were issued by subsidiaries or associated companies) are classified as either held-to-maturity, trading, or available-for-sale, depending primarily on the purpose of investment. Held-to-maturity securities are carried on the balance sheet at amortized cost and their estimated fair value is disclosed in the

Cash and cash-equivalent instruments = "cash and balances due from depository institutions" (BHCK0081 + BHCK0395 + BHCK0397) and "federal funds sold and securities purchased under agreements to resell" (BHDMB987 + BHCKB989)[35].

Net Trading Assets = the fair value of trading assets (BHCK3545) minus the fair value of trading liabilities (BHCK3548).

Debt maturing or repricing within the next year = Federal funds purchased and securities sold under agreements to repurchase (BHDMB993 + BHCKB995)[36] + domestic time deposits of $100,000 or more with a remaining maturity of one year or less (BHDMA242) + commercial paper (BHCK2309) + subordinated notes and debentures and other borrowed money with remaining maturity of one year or less (BHCK3409 + BHCK2332) + long-term debt that reprices within one year (BHCK3298) + interest-bearing foreign deposits (BHFN6636).

Fixed-rate long-term borrowing = domestic time deposits of $100,000 or more with a remaining maturity of more than one year (BHCB2604 + BHOD2604 - BHDMA242) + long term debt that does not reprice within the next year (BHCK4062 + BHCKC699[37] + BHCK2333 - BHCK3409 - BHCK3298).

Other tangible assets = premises and fixed assets (BHCK2145) + other real estate owned (BHCK2150) + investment in unconsolidated subsidiaries and associated companies (BHCK2130) + "other assets" (BHCK2160).

Other liabilities = minority interest in consolidated subsidiaries (BHCK3000) + perpetual preferred stock and related items (BHCK3283) + net liability for acceptances (BHCK2920 - BHCK2155)[38] + "other liabilities" (BHCK2750).

Traditional noninterest income (NONINTINC1) = service charges on deposit accounts in domestic offices (BHCK4483) + income from fiduciary activities (BHCK4070).

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footnotes. Available-for-sale and trading securities are reported on the balance sheet at fair value. Unrealized gains and losses on trading securities are included in income, while unrealized gains and losses on available for sale securities are excluded from net income and are reported in shareholders' equity on the balance sheet. Trading securities are included in the trading assets category discussed below.

[35] Prior to 2002, these items were reported combined as BHCK1350.

[36] Prior to 2002, these items were reported combined as BHCK2800.

[37] This item is included since 2005.

[38] The net liability for acceptances is calculated as the difference between "liability on acceptances executed and outstanding" (BHCK2920) and "customers liabilities on acceptances outstanding" (BHCK2155). Empirically, the asset and liability are very small and similar in magnitude. Accordingly the net liability for acceptances is negligible in essentially all cases. From Q1:2006, these items are no longer reported separately (they are included in "other liabilities").

Non-traditional but relatively persistent noninterest income (NONINTINC2) = investment banking, advisory, brokerage, and underwriting fees and commissions (BHCKB490) + insurance commissions and fees (BHCKC386 + BHCKC387)[39] + net income from servicing real estate mortgages, credit cards and other financial assets held by others (BHCKB492) + "other noninterest income" (BHCKB497).

Non-traditional low-persistence noninterest income (NONINTINC3) = trading revenue (BHCKA220) + venture capital revenue (BHCKB491) + net securitization income (BHCKB493) + net gains (losses) on sales of loans and leases (BHCK8560).

Noninterest expense (NONINTEXP) = salaries and employee benefits (BHCK4135) + expenses of premises and fixed assets (BHCK4217) + "other noninterest expense" (BHCK4092).

Earning assets = total assets - intangible assets - "other tangible assets" (as defined above).

Interest-sensitive earning assets = earning assets that are repriceable within one year or mature within one year (BHCK3197).

Fixed-rate earning assets = earning assets - interest-sensitive earnings assets.

Financial liabilities = total assets (BHCK2170) - total common equity (BHCK3210-BHCK3283) - "other liabilities" (as defined above).

Interest-sensitive liabilities = interest-bearing deposit liabilities that reprice within one year or mature within one year (BHCK3296) + federal funds purchased and securities sold under agreements to repurchase (BHDMB993 + BHCKB995)[40] + commercial paper (BHCK2309) + subordinated notes and debentures and other borrowed money with remaining maturity of one year or less (BHCK3409 + BHCK2332) + long-term debt that reprices within one year (BHCK3298) + variable rate preferred stock (BHCK3408).

Fixed-rate financial liabilities = financial liabilities - interest-sensitive liabilities.

Capital ratios: tier 1 leverage ratio (BHCK7204), tier 1 risk-based capital ratio (BHCK7206), and the total risk-based capital ratio (BHCK7205).

Dividend-to-equity (DIV) = cash dividends declared on common stock (BHCK4460) divided by the book value of tangible common equity.

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[39] Prior to 2003, these items were reported combined as BHCKB494.

[40] Prior to 2002, these items were reported combined as BHCK2800.

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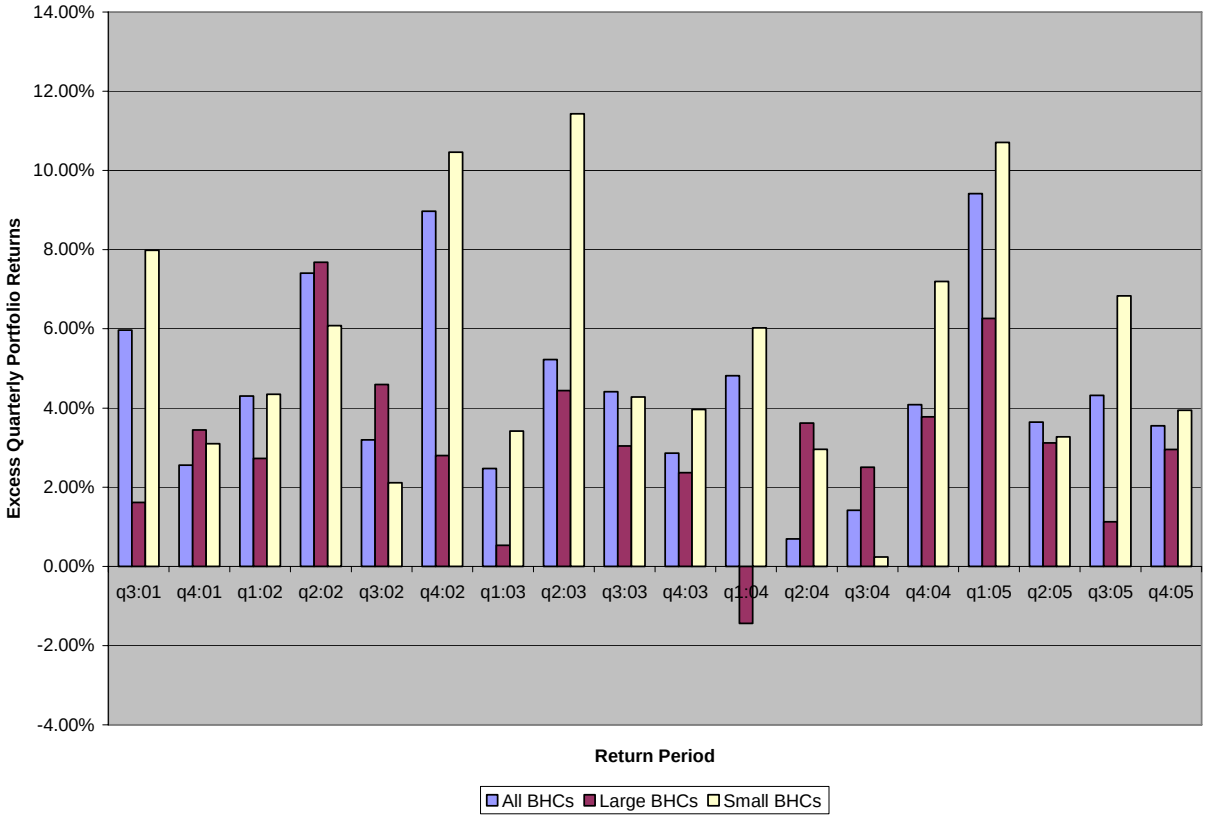
Figure1
Quarter-by-Quarter Returns to a Zero-Investment Strategy



This figure presents quarter-by-quarter returns to a zero-investment strategy that takes equal size long positions in high *VTM* firms (highest quartile) and short positions in low *VTM* firms (lowest quartile). *VTM* is the predicted value-to-market ratio, where predicted value is the fitted value from equation (7) times the bank's tangible common equity. Each return period starts three months after the end of the quarter for which *VTM* is calculated.

Table 1
Distribution of the Variables

	All BHCs (N = 7,443)					Large BHCs (N = 3,846)		Small BHCs (N = 3,597)	
	Mean	STD	Q1	Med.	Q3	Mean	Med.	Mean	Med.
Total Assets ($ mil.)	14,706	82,084	541	1,050	3,145	27,951	2,992	544	528
Equity / Total Assets	0.076	0.025	0.061	0.074	0.087	0.070	0.068	0.083	0.081
MTB	2.419	1.057	1.706	2.220	2.881	2.877	2.666	1.930	1.821
w_{LOANS}	9.296	3.131	7.302	9.000	11.013	9.739	9.509	8.821	8.482
$YIELD_{LOANS}$	0.072	0.012	0.063	0.070	0.078	0.069	0.068	0.074	0.072
ALLOW	0.014	0.005	0.011	0.013	0.015	0.015	0.014	0.014	0.013
NPL	0.008	0.008	0.003	0.006	0.010	0.008	0.007	0.008	0.006
CHARGE	0.003	0.005	0.000	0.002	0.004	0.004	0.002	0.002	0.001
CONSUMER	0.082	0.087	0.023	0.055	0.115	0.098	0.074	0.065	0.041
COMMER	0.165	0.102	0.095	0.146	0.210	0.178	0.160	0.150	0.132
$GROWTH_{LOANS}$	0.117	0.149	0.033	0.099	0.178	0.117	0.096	0.117	0.104
$w_{NONINTDEPO}$	1.293	0.817	0.729	1.154	1.643	1.283	1.169	1.304	1.140
$GROWTH_{NONINTDEPO}$	0.085	0.343	-0.004	0.110	0.229	0.084	0.104	0.085	0.115
$w_{INTCOREDEPO}$	7.500	2.587	5.921	7.224	8.782	7.659	7.427	7.329	6.969
$INT_{INTCOREDEPO}$	0.021	0.011	0.013	0.018	0.026	0.019	0.017	0.023	0.020
NOW	0.109	0.092	0.034	0.079	0.166	0.086	0.049	0.133	0.127
SAVINGS	0.537	0.197	0.396	0.530	0.689	0.600	0.605	0.470	0.452
$GROWTH_{INTCOREDEPO}$	0.116	0.157	0.024	0.085	0.175	0.120	0.086	0.112	0.083
FV_{SEC}	3.306	2.120	1.926	2.907	4.174	3.759	3.318	2.821	2.399
FV_{CASH}	0.803	0.742	0.415	0.606	0.951	0.791	0.566	0.815	0.661
$FV_{TRADING}$	0.037	0.249	0.000	0.000	0.000	0.069	0.000	0.002	0.000
FV_{STD}	2.659	2.193	1.301	2.158	3.280	3.294	2.686	1.980	1.682
w_{LTD}	1.229	1.150	0.475	0.982	1.616	1.356	1.079	1.093	0.896
$w_{OTHERASSET}$	0.724	0.455	0.473	0.643	0.837	0.835	0.723	0.606	0.566
$w_{OTHERLIAB}$	0.354	0.564	0.097	0.209	0.457	0.462	0.318	0.240	0.122
NONINTINC1	0.019	0.019	0.009	0.016	0.024	0.025	0.020	0.014	0.012
NONINTINC2	0.023	0.036	0.008	0.013	0.023	0.029	0.018	0.016	0.010
NONINTINC3	0.008	0.031	0.000	0.002	0.006	0.009	0.002	0.007	0.001
SA∆ NONINTINC	0.006	0.028	0.000	0.003	0.009	0.006	0.004	0.005	0.003
∆ NONINTINC	0.002	0.023	-0.002	0.001	0.004	0.002	0.001	0.001	0.001
NONINTEXP	0.111	0.060	0.080	0.100	0.127	0.117	0.105	0.105	0.094
SA∆ NONINTEXP	0.010	0.027	0.002	0.008	0.017	0.010	0.008	0.010	0.008
∆ NONINTEXP	0.002	0.021	-0.001	0.002	0.006	0.002	0.002	0.002	0.002
LOGTA	14.297	1.576	13.201	13.865	14.961	15.398	14.911	13.120	13.177
ABSGAP	2.089	2.156	0.748	1.542	2.873	2.169	1.613	2.004	1.484
GAP	0.160	2.998	-1.434	0.150	1.635	-0.119	-0.170	0.457	0.469
CAP	0.285	0.198	0.155	0.252	0.373	0.257	0.226	0.315	0.281
CAP2	0.120	0.229	0.024	0.064	0.139	0.101	0.051	0.142	0.080
DIV	0.013	0.010	0.007	0.012	0.018	0.016	0.016	0.009	0.009

The sample covers the period Q1:2001-Q3:2005. The variables are defined in Section 2.

Table 2
Summary Statistics from Cross-sectional Regressions of Valuation Model (7)

$$
\begin{aligned}
MTB = {} & w_{LOANS} \times (\alpha_1 + \alpha_2 YIELD_{LOANS} + \alpha_3 ALLOW + \alpha_4 NPL + \alpha_5 CHARGE \\
& + \alpha_6 CONSUMER + \alpha_7 COMMER + \alpha_8 GROWTH_{LOANS}) \\
& + w_{NONINTDEPO} \times (\beta_1 + \beta_2 GROWTH_{NONINTDEPO}) \\
& + w_{INTCOREDEPO} \times (\delta_1 + \delta_2 INT_{INTCOREDEPO} + \delta_3 NOW + \delta_4 SAVINGS + \delta_5 GROWTH_{INTCOREDEPO}) \\
& + FV_{SEC} + FV_{CASH} + FV_{TRADING} - FV_{STD} + w_{LTD} v_{LTD} + w_{OTHERASSET} v_{OTHERASSET} + w_{OTHERLIAB} v_{OTHERLIAB} \\
& + \gamma_1 NONINTINC1 + \gamma_2 NONINTINC2 + \gamma_3 NONINTINC3 + \gamma_4 SA\Delta NONINTINC + \gamma_5 \Delta NONINTINC \\
& + \rho_1 NONINTEXP + \rho_2 SA\Delta NONINTEXP + \rho_3 \Delta NONINTEXP \\
& + \lambda_1 LOGTA + \lambda_2 ABSGAP + \lambda_3 GAP + \lambda_4 CAP + \lambda_5 CAP2 + \lambda_6 DIV + \varepsilon
\end{aligned}
$$

	All BHCs (N = 7,443)					Large BHCs (N = 3,846)		Small BHCs (N = 3,597)	
	Mean	t-stat	Q1	Med.	Q3	Mean	t-stat	Mean	t-stat
α_1	0.915	36.5	0.874	0.907	0.964	0.864	35.6	0.923	35.6
α_2	2.452	8.1	2.209	2.478	2.660	3.523	15.3	2.346	3.6
α_3	-0.055	-0.1	-1.065	-0.304	0.317	0.062	0.2	0.060	0.1
α_4	-0.883	-6.8	-1.173	-0.974	-0.566	-1.375	-5.1	-0.774	-5.3
α_5	-1.201	-3.9	-1.871	-1.052	-0.523	-2.548	-4.4	-0.533	-2.0
α_6	-0.086	-7.7	-0.098	-0.085	-0.072	-0.108	-9.5	-0.082	-4.8
α_7	-0.047	-1.8	-0.089	-0.064	0.008	-0.043	-1.2	-0.015	-0.6
α_8	0.026	1.6	0.002	0.026	0.069	0.059	2.6	0.025	1.6
v_{LOANS}	1.066	40.1	1.042	1.057	1.110	1.077	44.7	1.081	83.9
β_1	-0.905	-46.4	-0.955	-0.900	-0.856	-0.885	-46.6	-0.894	-38.3
β_2	0.075	2.8	0.040	0.094	0.149	0.029	0.5	0.060	1.5
$v_{NONINTDEPO}$	-0.899	-48.0	-0.947	-0.895	-0.857	-0.884	-59.5	-0.889	-39.7
δ_1	-0.902	-27.6	-0.944	-0.913	-0.819	-0.871	-25.9	-0.864	-39.6
δ_2	-5.263	-3.8	-6.032	-5.048	-3.954	-6.255	-5.4	-4.417	-6.6
δ_3	0.084	5.5	0.041	0.074	0.136	0.082	2.3	0.041	1.9
δ_4	0.086	2.4	0.039	0.090	0.130	0.090	1.5	0.035	2.5
δ_5	0.054	1.6	0.022	0.050	0.088	0.019	0.6	0.049	2.1
$v_{INTCOREDEPO}$	-0.938	-130.3	-0.951	-0.936	-0.918	-0.918	-165.4	-0.927	-61.0
v_{LTD}	-0.996	-30.5	-1.047	-0.977	-0.945	-0.983	-40.2	-1.038	-70.6
$v_{OTHERASSET}$	0.789	9.9	0.590	0.831	0.933	0.785	6.0	0.695	18.9
$v_{OTHERLIAB}$	-0.743	-6.3	-0.917	-0.769	-0.518	-0.816	-7.6	-0.947	-16.8
γ_1	23.238	19.4	20.031	24.006	25.396	25.399	17.0	15.807	19.8
γ_2	17.009	21.8	15.634	17.595	18.434	19.975	4.7	11.376	6.7
γ_3	15.221	10.0	11.609	16.111	19.563	17.686	21.4	9.808	8.9
γ_4	-1.900	-3.7	-3.307	-2.063	0.067	-1.705	-1.4	-1.949	-3.2
γ_5	-4.757	-5.7	-7.997	-4.856	-2.097	-5.471	-4.4	-2.926	-3.7

Table 2 continued

	All BHCs (N = 7,443)					Large BHCs (N = 3,846)		Small BHCs (N = 3,597)	
	Mean	t-stat	Q1	Med.	Q3	Mean	t-stat	Mean	t-stat
ρ_1	-14.566	-10.4	-16.877	-15.421	-11.740	-16.874	-25.6	-11.112	-9.4
ρ_2	2.991	2.1	-0.672	2.888	5.093	3.860	2.1	3.417	2.5
ρ_3	3.821	5.6	1.572	3.740	5.653	5.817	5.1	2.444	2.0
λ_1	0.042	7.4	0.028	0.038	0.055	0.034	5.2	0.014	3.8
λ_2	0.006	1.1	-0.008	0.005	0.014	0.019	1.8	-0.008	-0.8
λ_3	0.033	9.7	0.022	0.037	0.046	0.047	14.9	0.026	4.2
λ_4	-1.223	-6.0	-1.684	-1.185	-0.688	-1.371	-3.9	-0.333	-2.8
λ_5	0.938	11.9	0.717	0.911	1.110	1.297	4.6	0.234	2.3
λ_6	28.255	6.7	18.059	29.272	33.440	29.034	8.1	19.219	4.6
R-Square	0.708		0.669	0.708	0.739	0.757		0.561	
N	392		376	399	404	202		189	

The sample covers the period Q1:2001-Q3:2005. The statistics are derived from the time-series distribution of the cross-sectional quarterly regressions. The t-statistics are calculated assuming the quarterly coefficients follow an AR(1) process. The variables are defined in Sections 2 and 3.

Table 3
Value Creation by Activity

Panel A: Value contribution

	All BHCs (N = 7,443)				Large BHCs (N = 3,846)				Small BHCs (N = 3,597)			
	Mean	Med.	Std	IQ	Mean	Med.	Std	IQ	Mean	Med.	Std	IQ
Loans	0.63	0.58	0.61	0.78	0.80	0.70	0.71	0.92	0.72	0.67	0.43	0.54
Noninterest-bearing deposits	0.14	0.11	0.13	0.14	0.15	0.13	0.12	0.13	0.15	0.13	0.14	0.15
Interest-bearing deposits	0.48	0.42	0.44	0.53	0.64	0.58	0.48	0.58	0.54	0.49	0.40	0.49
Noninterest income	0.93	0.69	0.99	0.64	1.32	0.99	1.40	0.79	0.45	0.35	0.43	0.31
Noninterest expense	-1.58	-1.43	0.97	0.91	-1.92	-1.71	1.13	0.93	-1.11	-0.99	0.68	0.69
Other explained	0.83	0.75	0.47	0.55	0.88	0.81	0.52	0.59	0.19	0.20	0.30	0.37
Unexplained	0.00	-0.05	0.55	0.63	0.00	-0.03	0.54	0.65	0.00	-0.04	0.43	0.49
Total	1.42	1.22	1.06	1.18	1.88	1.67	1.13	1.18	0.93	0.82	0.69	0.82

Panel B: Standardized value contribution (percentage points)

	All BHCs (N = 7,443)				Large BHCs (N = 3,846)				Small BHCs (N = 3,597)			
	Mean	Med.	Std	IQ	Mean	Med.	Std	IQ	Mean	Med.	Std	IQ
Loans	44	54	15	19	43	48	15	20	77	84	15	18
Noninterest-bearing deposits	10	10	3	3	8	9	3	3	16	16	5	5
Interest-bearing deposits	34	39	11	13	34	39	10	13	57	61	14	16
Noninterest income	65	64	24	15	71	67	29	17	48	44	15	10
Noninterest expense	-110	-134	23	22	-103	-116	23	20	-118	-125	24	23
Other explained	58	70	11	13	47	55	11	13	20	25	11	12
Unexplained	0	-5	13	15	0	-2	11	14	0	-5	15	16
Sum	100	100	100	100	100	100	100	100	100	100	100	100

IQ is the inter-quartile range. In Panel A, the variables measure value-creation by activity per dollar of equity book value. They are calculated using the coefficient estimates form equation (7) (Table 2). Precise definitions are provided in Section 4.2. Panel B is derived from Panel A by dividing the columns of Panel A by the corresponding sum of components.

Table 4
Correlations between Values Created by Various Activities
(Pearson below the Diagonal, Spearman above the Diagonal)

Panel A: All BHCs

		V1	V2	V3	V4	V5	V6	V7	V8	V9
V1	Total		0.82	0.28	0.17	0.45	0.37	-0.24	0.39	0.46
V2	Explained	0.85		0.31	0.19	0.54	0.48	-0.29	0.47	-0.06
V3	Loans	0.24	0.28		0.35	0.22	-0.04	-0.36	-0.36	0.00
V4	Noninterest-bearing deposits	0.16	0.19	0.33		0.28	0.22	-0.51	-0.08	0.01
V5	Interest-berating deposits	0.44	0.52	0.24	0.25		0.30	-0.50	0.12	-0.04
V6	Noninterest income	0.49	0.58	0.01	0.14	0.21		-0.64	0.33	-0.06
V7	Noninterest expense	-0.32	-0.37	-0.36	-0.39	-0.44	-0.77		-0.09	0.02
V8	Other explained	0.70	0.54	-0.33	-0.06	0.13	0.32	-0.15		-0.03
V9	Unexplained	0.53	0.01	0.01	0.01	0.01	0.01	-0.01	0.01	

Panel B: Large BHCs

		V1	V2	V3	V4	V5	V6	V7	V8	V9
V1	Total		0.83	0.25	0.20	0.34	0.28	-0.19	0.31	0.44
V2	Explained	0.88		0.28	0.23	0.43	0.38	-0.25	0.36	-0.07
V3	Loans	0.22	0.25		0.26	0.02	-0.25	-0.13	-0.31	-0.01
V4	Noninterest-bearing deposits	0.21	0.24	0.24		0.14	0.18	-0.32	-0.08	-0.01
V5	Interest-berating deposits	0.38	0.44	0.04	0.16		0.19	-0.34	0.05	-0.05
V6	Noninterest income	0.52	0.59	-0.13	0.14	0.17		-0.68	0.22	-0.09
V7	Noninterest expense	-0.37	-0.42	-0.17	-0.26	-0.33	-0.81		-0.14	0.04
V8	Other explained	0.38	0.43	-0.27	-0.06	0.08	0.20	-0.19		-0.01
V9	Unexplained	0.47	-0.01	0.00	0.00	0.00	0.00	0.01	-0.01	

Panel C: Small BHCs

		V1	V2	V3	V4	V5	V6	V7	V8	V9
V1	Total		0.78	0.45	0.21	0.52	0.25	-0.24	0.20	0.51
V2	Explained	0.79		0.57	0.26	0.63	0.32	-0.31	0.24	-0.08
V3	Loans	0.46	0.58		0.25	0.43	0.26	-0.54	-0.29	-0.03
V4	Noninterest-bearing deposits	0.21	0.26	0.27		0.28	0.32	-0.49	-0.08	0.00
V5	Interest-berating deposits	0.49	0.63	0.47	0.24		0.34	-0.57	-0.09	-0.02
V6	Noninterest income	0.21	0.26	0.29	0.24	0.31		-0.70	0.00	-0.03
V7	Noninterest expense	-0.21	-0.26	-0.54	-0.41	-0.56	-0.79		0.07	0.00
V8	Other explained	0.17	0.22	-0.34	-0.14	-0.17	-0.12	0.15		-0.02
V9	Unexplained	0.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

Correlation coefficients greater than 0.04 in absolute value are significant at the 5% level. The variables measure value-creation by activity per dollar of equity book value. They are calculated using the coefficient estimates form equation (7) (Table 2). Precise definitions are provided in Section 4.2.

Table 5
Portfolio Analysis of the Predictability of Excess Stock Returns
Using Predictions of Valuation Model (7)

Panel A: All BHCs

Portfolio	1 quarter	2 quarters	3 quarters	1 year
1 (low *VTM*)	-2.1%	-3.8%	-4.7%	-5.8%
	-6.0	-5.7	-4.1	-8.4
2	-1.0%	-1.9%	-2.8%	-3.7%
	-4.1	-5.5	-5.1	-2.7
3	-0.1%	-0.1%	-0.6%	-0.4%
	-0.7	-0.3	-1.0	-2.2
4	1.0%	1.9%	2.7%	2.9%
	2.9	4.3	4.4	13.9
5 (high *VTM*)	2.3%	3.5%	4.9%	6.3%
	9.6	6.1	4.3	6.1
5 – 1	4.4%	7.4%	9.6%	12.1%
	9.3	6.5	4.7	9.3

Panel B: Large BHCs

Portfolio	1 quarter	2 quarters	3 quarters	1 year
5 – 1	3.1%	5.8%	7.9%	9.8%
	5.9	7.8	6.2	5.5

Panel C: Small BHCs

Portfolio	1 quarter	2 quarters	3 quarters	1 year
5 – 1	5.5%	8.4%	10.8%	14.1%
	10.1	8.1	6.8	7.3

The table reports time-series means and t-statistics for excess returns on selected portfolios. The t-statistics are calculated assuming the portfolio returns follow an ARMA(1,q-1) process, where q is the number of quarters in the return period. For each portfolio, excess returns are measured as the difference between the equally-weighted portfolio return and the equally-weighted contemporaneous return on all bank stocks. Portfolios are constructed each quarter by sorting stocks based on the predicted value-to-market ratio (*VTM*), where predicted value is the fitted value from equation (7) times the bank's tangible common equity. The return accumulation period starts three months after the end of the quarter.

Table 6
Summary Statistics from Cross-sectional Regressions Examining the Predictability of Abnormal Stock Returns Using Predictions of Valuation Model (7)

$$RET = \eta_1 + \eta_2 VTM + \eta_3 BTM + \eta_4 LOGMV + \eta_5 \beta_{market} + \eta_6 abs(\beta_{interest}) + \eta_7 abs(\beta_{slope}) + \eta_8 \beta_{spread} + \eta_9 VOLAT + \varepsilon$$

Panel A: Restricted model, all BHCs

Horizon	Intercept	*VTM*	*BTM*	*LOGMV*	R^2	N
1 quarter	0.075	0.057	-0.012	-0.007	0.069	384
	1.9	7.1	-0.6	-2.3		
2 quarters	0.196	0.093	-0.025	-0.015	0.086	377
	2.2	6.7	-0.7	-1.8		
3 quarters	0.307	0.114	-0.015	-0.021	0.108	370
	1.8	2.3	-0.3	-2.2		
1 year	0.423	0.123	0.015	-0.029	0.121	363
	1.0	3.6	0.2	-1.0		

Panel B: Restricted model, large BHCs

Horizon	Intercept	*VTM*	*BTM*	*LOGMV*	R^2	N
1 quarter	0.067	0.037	0.022	-0.006	0.066	198
	1.4	3.7	0.9	-1.8		
2 quarters	0.149	0.066	0.046	-0.011	0.087	195
	1.6	3.3	1.4	-1.7		
3 quarters	0.221	0.095	0.085	-0.017	0.114	191
	2.2	2.8	1.1	-2.8		
1 year	0.300	0.097	0.153	-0.022	0.132	187
	0.8	3.5	2.8	-0.9		

Panel C: Restricted model, small BHCs

Horizon	Intercept	*VTM*	*BTM*	*LOGMV*	R^2	N
1 quarter	0.131	0.085	-0.044	-0.012	0.061	186
	1.8	8.3	-3.0	-2.1		
2 quarters	0.381	0.134	-0.099	-0.031	0.068	182
	1.7	6.2	-3.5	-2.4		
3 quarters	0.620	0.162	-0.124	-0.047	0.070	179
	2.0	5.7	-5.2	-2.7		
1 year	0.859	0.183	-0.136	-0.064	0.070	176
	2.5	3.6	-2.3	-1.4		

Panel D: Full model, all BHCs

Horizon	Intercept	*VTM*	*BTM*	*LOGMV*	β_{market}	$abs(\beta_{interest})$	$abs(\beta_{slope})$	β_{spread}	*VOLAT*	R^2	N
1 quarter	0.057	0.054	-0.013	-0.007	0.012	-0.003	-0.021	-0.018	0.183	0.109	277
	1.6	8.0	-0.9	-3.2	0.9	-0.1	-0.7	-1.9	1.0		
2 quarters	0.148	0.094	-0.026	-0.015	0.027	-0.007	-0.089	-0.035	0.474	0.133	271
	0.9	4.2	-1.0	-2.2	1.0	-0.1	-0.9	-1.9	1.3		
3 quarters	0.218	0.123	-0.016	-0.021	0.040	-0.003	-0.176	-0.049	0.831	0.162	265
	1.5	7.0	-0.3	-2.4	1.1	0.0	-1.8	-1.4	2.7		
1 year	0.299	0.142	0.000	-0.028	0.046	0.023	-0.329	-0.067	1.191	0.185	258
	1.3	4.7	0.0	-1.4	0.7	0.1	-6.3	-1.1	1.0		

The table reports time-series means and t-statistics from cross-sectional regressions of stock returns on the predicted value-to-market ratio (*VTM*) and control variables. The predicted value is the fitted value from equation (7) times the bank's tangible common equity. The return accumulation periods starts three months after the end of the quarter. The t-statistics are calculated assuming the coefficients follow an ARMA(1,q-1) process, where q is the number of quarters in the return period. The control variables are the book-to-market ratio (*BTM*), the log of market value of common equity (*LOGMV*), estimates of stock return sensitivities to relevant risk factors (the β variables), and an estimate of idiosyncratic stock volatility (*VOLAT*). The beta variables are estimated by regressing excess monthly stock returns during the sixty months ending in the valuation quarter on excess market return (*market*), the monthly change in the one-year U.S. Treasury bill (*interest*), the monthly change in the slope of the term-structure (*slope*, the difference between the yields on 10 and 1 year U.S. Treasury bond/bill), and the monthly change in the market credit spread (*spread*, the difference between Moody's AAA and BAA Corporate bond yields). "abs(.)" denotes the absolute value function. *VOLAT* is measured as the root mean squared error from the beta regression.

Table 7
Summary Statistics from Cross-sectional Regressions
Explaining the Predictability of Stock Returns

$$MISPRICING = \lambda_1 + \lambda_2 AF + \lambda_3 IO + \lambda_4 LOGMV + \lambda_5 LOGP + \lambda_6 TURN + \varepsilon$$

	Intercept	*AF*	*IO*	*LOGMV*	*LOGP*	*TURN*	R^2	N
All BHCs	0.254	-0.010	0.143	-0.012	-0.014	-0.115	0.046	378
	4.3	-2.5	3.0	-2.8	-0.7	-15.9		
Large BHCs	-0.009	-0.034	0.132	0.003	0.019	-0.101	0.058	199
	-0.1	-4.2	2.7	0.7	1.2	-10.5		
Small BHCs	1.685	0.024	0.227	-0.150	0.005	-0.041	0.143	179
	14.3	2.8	3.8	-15.0	0.4	-1.5		

The table reports time-series means and t-statistics from cross-sectional quarterly regressions. The t-statistics are calculated assuming the quarterly coefficients follow an AR(1) process. *MISPRICING* is the absolute value of (*VTM* – 1), where *VTM*—the predicted value-to-market ratio—is calculated as the product of the fitted value from equation (7) times the bank's tangible common equity and divided by the market value of common equity. *AF* is the number of EPS forecasts for the current year reported by IBES in the last month of the quarter. *IO* is measured as the fraction of the firm's outstanding shares held by large institutional investors at the end of the quarter. *LOGMV* is the log of market value of common equity. *LOGP* is the log of the firm's share price at the end of the quarter. *TURN* is the logarithm of the average ratio of the stock's monthly trading volume to total shares outstanding during the twelve months ending at the end of the quarter.