The financial performance of pure play Internet banks

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Introduction and summary

The number of banks and thrifts that offer financial services over the Internet is increasing rapidly in the U.S. By using "transactional websites," customers can check account balances, transfer funds, pay (and perhaps receive) bills, apply for loans, and perform a variety of other financial transactions without leaving their home or place of business. Approximately 1,100 U.S. banks and thrifts operated transactional websites at year-end 1999—an elevenfold increase over year-end 1997—and projections by bank regulators suggest that nearly half of U.S. banks will offer transactional websites by late 2001 or early 2002 (Furst, Lang, and Nolle, 2000).

Most banks and thrifts that operate over the Internet use a *click and mortar* business strategy, maintaining traditional networks of brick and mortar branches along with their transactional websites. Only a small number of banks and thrifts have completely abandoned physical branches in favor of a *pure play Internet* business strategy, relying exclusively on transactional websites to deliver banking services. As of mid-year 2000, less than two dozen of these virtual banks and thrifts were operating in the U.S., and their market penetration rates were in the low single digits. Various surveys report that Internet-only banks have captured less than 5 percent of the U.S. online banking market, and less than 1 percent of all Internet banking customers consider an Internet-only bank or thrift to be their primary bank.[1]

In theory, the pure play Internet model offers advantages for both banks and their customers. The central financial advantage stems from the savings associated with not having to operate branches. If being branchless substantially reduces physical overhead expenses, and if these savings are not offset by reductions in revenues or increases in other expense items, then, all else equal, Internet-only banks will earn high profits. Customers benefit not only from increased convenience, but also because these banks (again, in theory) can use some of their overhead cost savings to pay higher interest rates. The ability to pay above-market interest rates, combined with access to a much wider base of potential depositors, arguably allows these banks to grow faster than traditional banks.

In practice, however, the degree to which pure play Internet banks can actually deliver these benefits is not yet clear. The pure play business model, the banks that deploy it, and the technology on which it relies are still relatively young, so learning effects have not yet been exhausted. Furthermore, most of the existing evidence on Internet bank performance is anecdotal, and the few systematic studies of Internet bank performance do not distinguish between the pure play model and the click and mortar model.

This article represents a first attempt to analyze systematically the financial performance of pure play Internet banks. Unlike previous studies of Internet banks that include any branching or branchless bank that operates a transactional website, this article focuses on a small sample of six branchless banks and thrifts that distribute financial services exclusively through their websites. The pure play banks and thrifts in this sample are all newly chartered institutions, so I evaluate their financial performance relative to a benchmark sample of newly chartered banks and

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thrifts that have branches. I compare the two samples across 17 different measures of financial performance, using multiple regression analysis to control for differences in age, local economic environment, and regulatory conditions.

For this set of relatively young banks, my tests indicate that the average pure play Internet bank is significantly less profitable than the average branching bank. A number of factors contribute to this poor financial performance, including high labor expenses, low noninterest income, and difficulty attracting core deposits. My results also bring to light two fallacies about the standard Internet banking model, at least as implemented by the institutions in this sample: Overall overhead expenses are not necessarily lower, and overall deposit interest rates are not necessarily higher, compared with branching banks. However, consistent with the standard Internet banking model, my results indicate that Internet banks tend to grow faster than traditional branching banks. In sum, the early financial performance of these pure play Internet banks is reminiscent of the early financial performance of many nonfinancial dot-com companies: fast growth but low (or no) profits.

These results are intriguing because they imply that pure play Internet banking may not be a financially viable business model. However, the data presented here—which come from a small number of relatively young banks and thrifts using a largely untested business model—are not sufficient by themselves to support such a strong conclusion. As the pure play institutions analyzed here become more financially mature, as additional banks and thrifts adopt a pure play Internet approach, and as all of these institutions learn from each other's experiences, the financial performance of this business model may well improve. This article is an early attempt to analyze the financial performance of pure play Internet banks, and future studies using larger data sets and different analytic approaches may come to different conclusions. The results of this article should be interpreted with these caveats in mind.

The Internet and bank distribution channels

As the number of banks with fully transactional Internet sites increases—from zero only a few years ago to well over 1,000 today—the overall mix of bank distribution channels is also changing. As the number of commercial banks in the U.S. declined from roughly 12,000 to 8,500 during the 1990s, the number of branch locations increased from about 64,000 to 74,000, and the number of ATMs (automated teller machines) soared from around 80,000 to well over 200,000.[2] At the same time, the definitions of branch and ATM are changing. Some banks are converting their ATMs into "kiosks" that combine a telephone, an ATM, and an Internet terminal.[3] Increasingly, limited service branches are located in supermarkets or other retail establishments, and some of these "mini-branches" feature Internet kiosks in place of, or along with, teller windows.

This movement toward a less-centralized distribution system affects both customer convenience and banking costs. Convenience may increase because customers do not have to travel as far to perform basic banking transactions, and banks could potentially have lower overhead expenses as the number of full service branches declines. For example, it has been estimated that branch banking costs about $1.07 per transaction, telephone banking costs about $0.55 per transaction, ATM banking costs about $0.27 per transaction, and Internet banking costs about $0.01 per transaction.[4]

These distribution channels are not perfect substitutes. Checking an account balance, transferring funds, paying bills, and applying for credit cards do not require personal contact or a large physical space, and hence are well suited for delivery over the Internet channel. But setting up a new account, applying for a business loan, retirement planning, closing a mortgage, and other complex transactions often require a secure physical space and/or person-to-person communication. Furthermore, getting cash is impossible over the Internet and requires either branches or ATMs. Because some banking transactions are more conducive to some channels than to others, and because some customers prefer certain delivery channels, most (but not all) banks deploy a combination of delivery channels.

Most large and mid-sized banks treat different distribution channels as complements, and augment their physical branch locations with ATMs, call centers, and transactional Internet websites. The *click and mortar* banking strategy mentioned above is a good example of this approach. Although maintaining a network of branch offices requires substantial overhead expenditures, this strategy provides both convenient high-tech distribution and low-tech branch-based service options, and allows banks to sell a full range of banking services to a wide range of customers. Sometimes click and mortar banks use a *trade name* strategy, in which they create a separate brand identity for their Internet channels. This is simply a marketing distinction—trade name "banks" do not have separate banking charters and do not report separate financial statements—and this strategy is successful

only if the separate brand identity generates enough additional revenue to offset the additional marketing expenditures. (Perhaps the best known example of this strategy is Wingspan Bank, which is operated by First USA, an affiliate of Bank One.)

Other banks treat different distribution channels as substitutes, and serve their customers predominantly through a single channel. The *pure play Internet* banking strategy mentioned above is a good example of this approach. Because some products are difficult to deliver, and some customers are difficult to serve, over a single delivery channel, this approach is most likely to be effective as part of a niche strategy. For example, a recent study found that 70 percent of online banking customers said they would consider opening a new account at a bank with physical locations, but only 40 percent would consider doing so at an Internet-only bank.[5] Along these same lines, the traditional *brick and mortar* banking strategy may be profitable for community banks that specialize in products or customers that require person-to-person service. But as customers become more familiar with the Internet, there may be less room in the market for banks that completely exclude the Internet channel.

A financial model of pure play Internet banks

The central financial characteristic of the pure play Internet banking model is reduced overhead spending. By eliminating its physical branch locations, the pure play bank can substantially reduce expenses on rent (or mortgage payments), on upkeep and maintenance, and, most importantly, on the labor needed to run branch locations. Banks can use these savings to increase the per-unit profit on their existing business. Or banks can use the savings to increase their market share, attracting customers by paying higher interest rates on deposits or charging lower interest rates on loans. Although this will reduce the bank's interest margin, increasing the bank's size could create beneficial scale effects by spreading administrative costs over a greater volume of business or allowing the bank to market fee-based services (like investment or insurance products) to a greater number of captive customers.

The simple financial statements displayed in table 1 illustrate the potential financial advantages of the pure play Internet strategy. The balance sheet shown in panel A leaves out many items normally

TABLE 1

Potential advantages of pure play Internet model
($millions, unless stated otherwise)

A. Balance sheet

Cash	40	Deposits	450
Securities	140	Other liabilities	5
Loans	310		
Plant and other	10	Equity	45
Total assets	500	Liabilities and equity	500

B. Income statements

	Brick and mortar bank	Internet bank 1	Internet bank 2
Assumptions			
Rate on loans, securities (%)	7.50	7.50	7.50
Rate on deposits (%)	3.33	3.33	4.00
Noninterest income	7	7	7
Noninterest expense	15	12	12
Interest revenue	33.75	33.75	33.75
Interest expense	15.00	15.00	18.00
Net interest income	18.75	18.75	15.75
Noninterest income	7.00	7.00	7.00
Noninterest expense	15.00	12.00	12.00
Before tax profit	10.75	13.75	10.75
Tax (40%)	4.30	5.50	4.30
Net income	6.45	8.25	6.45
Return on assets (%)	1.29	1.65	1.29
Return on equity (%)	14.33	18.33	14.33

found on bank balance sheets, but it offers a reasonable representation of the composition of assets, liabilities, and equity at the typical U.S. commercial bank with $500 million in assets in 2000. The income statements are derived using the numbers on the balance sheet plus four additional numbers for the typical $500 million bank: the average interest rate paid on deposits, the average interest rate (including loan origination fees) received on loans and securities investments, total noninterest revenues, and total noninterest expenses.

Three different versions of the income statement are presented in panel B. The first column presents the income statement for a hypothetical brick and mortar bank that pays on average an interest rate of 3.33 percent on its deposit liabilities, and earns an average interest rate of 7.50 percent on its investments in loans and securities. Given these rates, the brick and mortar bank earns an interest margin of 4.17 percent and has an interest margin-to-assets ratio of about 3.75 percent. The bottom line is that the brick and mortar bank earns a 1.29 percent return on assets and a 14.33 percent return on book equity.

The second column (Internet bank 1) illustrates how the bank's profitability *might* change if it adopted an Internet distribution strategy, and if such a change in strategy allowed the bank to reduce its overhead expenditures by closing its brick and mortar branches. Note that one of the main assumptions changes—noninterest expenses decline by a hypothetical 20 percent, from $15 million a year to $12 million per year. (Even if a bank closed all its branches and successfully migrated its customers to the Internet, noninterest expenditures would not fully disappear. The bank would still have some physical space requirements, it would have to increase its expenditures on computer equipment, and it would still have labor expense—the biggest expense at banks after interest payments.) Assuming no other offsetting effects, the financial impact of this change would go straight to the bank's bottom line. Return on assets (ROA) would increase to 1.65 percent, and return on equity (ROE) would increase to 18.33 percent.

As discussed above, these increased profits could be simply paid out to the shareholders, or they could be retained and used to grow the bank. The third column (Internet bank 2) assumes that the bank uses the hypothetical overhead savings to attract additional depositors by paying higher rates on deposits. In this example, the bank increases its deposit rate by a hypothetical 20 percent, from 3.33 percent to 4.00 percent. This change reduces the bank's interest margin from 4.17 percent to 3.67 percent, but its return on assets and return on equity remain the same as the brick and mortar bank's. Over time these relatively high deposit rates might attract a greater number of customers to the bank, allowing it to grow faster than its brick and mortar competitors.[6] (Although not shown in table 1, a similar result could be accomplished by reducing the interest rate charged to borrowers from 7.50 percent to 6.834 percent, while leaving the deposit interest rate unchanged.)

Of course, this is a very simple model—in practice, a number of potentially offsetting financial or marketing effects could come into play. On the downside, the Internet bank must be able to generate loans, attract deposits, and sell fee-based services (for example, mutual funds, investment advice, insurance products) of the same amount and quality as the brick-and-mortar bank, despite having fewer physical locations for face-to-face contact with customers. On the upside, switching from physical branches to Internet distribution *may* generate financial and marketing benefits that are not captured in this simple model. Reductions in plant and equipment on the balance sheet could allow more assets to be shifted into revenue-generating loans or securities. The bank could use the Internet to gather deposits and market loans in new geographic locations, potentially increasing its growth rate and allowing for risk-reducing diversification effects. And customers that use the Internet for banking are likely to be more educated, sophisticated, and wealthy, and, therefore, more profitable customers.

Performance of the Internet banking model: Anecdotal evidence

One might persuasively argue that because Internet banking is so new, and because it is such a fundamentally different way to bank, it is too early to gauge the ultimate success of this business model. However, an increasing amount of anecdotal evidence testifies to various weaknesses of Internet banking—weaknesses that will have to be addressed for the pure play banking model to enjoy widespread viability in the future.

Person-to-person service

The U.S. has a relatively recent history of local banking, with tens of thousands of banks, thrifts, and credit unions focusing their efforts on individual cities, towns, and counties. Given this history, many Americans have come to expect in-person service, and very often name recognition, at their bank. Federal Reserve Chairman Alan Greenspan recently said "we should not lose sight of the exceptional value of franchises based on old-fashioned face-to-face interpersonal banking," a clear suggestion that traditional banking,

for at least some customers and/or products, will not wither away any time soon.[7]

Internet banking is the antithesis of high-touch, person-to-person banking. At an Internet bank, customer complaints must be resolved over the telephone or by e-mail, which can be frustrating for an already annoyed client. Customer requests that are simple at a brick-and-mortar bank, such as picking up additional deposit slips, become more complicated at an Internet bank, costing the bank postage and handling and requiring the customer to wait. Potential mortgage borrowers may be willing to shop for loan rates over the Web, but they are often reluctant to apply for these highly complicated financial products without person-to-person contact. A recent survey found that 85 percent of homebuyers use the Web for research but only 10 percent are comfortable getting their mortgage from a Web-only institution; another survey found that Internet banks get the majority of their mortgage originations from third party mortgage brokers.[8] If Internet-only banks have trouble generating mortgages and other types of loans, they have to make up the difference by investing in lower yielding securities (for example, mortgage-backed securities) or purchasing loans on the wholesale market where competition drives down margins.

Deposit pricing

Unable to attract depositors by offering in-person service, Internet banks often attempt to attract depositors that are interest-rate sensitive. A recent survey found that 14 Internet banks (which included both Internet-only and trade name Internet banks) offered an average rate of 6.875 percent on 12-month CDs (certificates of deposit), while 21 traditional banks offered an average rate of 6.29 percent. Another survey found that checking accounts at Internet-only banks generally paid between 3 percent and 6 percent (and were sometimes accompanied by no-fee or low-fee bill-paying services), compared with only about 2 percent at traditional banks.[9]

But these higher deposit rates are often merely short-run teaser rates designed to nab new customers—especially at trade name Internet banks and click and mortar banks where high deposit rates can be subsidized by other parts of the organization—and may not reflect the overall deposit rate structure of the bank.[10] These rates often attract financially savvy "hit-and-run" customers, who search the Web for high deposit rates and do not purchase additional services from the bank. These deposits typically flow out of the bank when interest rates are reduced or when the CD matures and, hence, do not represent long-term, core deposit funding. This is a primary reason that one industry consultant concluded that 70 percent of Internet customers are unprofitable, compared with 50 percent of non-Internet customers.[11] Thus, one of the theoretical financial advantages of the simple Internet banking model—growing the bank based on its ability to profitably pay above-market interest rates on deposits—may not work well in practice.

Getting cash and depositing checks

The most obvious problem for a bank without branches involves cash—how can customers get cash out of their accounts when they need it? Some Internet-only banks, like E*tradebank, maintain their own fleet of ATMs. Although ATMs are, of course, much less expensive than bank branches, they nonetheless represent an unwelcome expense for Internet banks.[12] Some Internet-only banks simply rebate to the depositor $5 or $6 in foreign ATM fees per month (typically enough to cover four to six ATM transactions), while some banks use a combination of the two approaches.

A similar problem arises when customers need to deposit checks into their Internet-only bank accounts. Direct deposit (ACH) works fine for repeating deposits like paychecks, but for non-repeating deposits customers typically must deposit by mail, which can be inconvenient and adds several days to the time a customer must wait before drawing on those funds. Some Internet banks have made alternative arrangements. For example, Wingspan Bank allows customers to make deposits in ATMs that are part of four regional electronic-transfer networks (NYCE, Fifth Third's Jeanie network, Star Systems, and MAC), and NationalInterBank.com allows customers to send their deposits by overnight mail at Mail Boxes Etc. locations. Of course, these arrangements also add to banks' expenses. A related problem involves funding new accounts. A large percentage of new accounts at Internet banks are never funded; depositors complete the online application form but never mail the funds. To combat this problem, NetBank allows new accounts to be funded at the time of application with credit cards or electronic transfers drawn on accounts at other banks.

In the future, smart cards that serve as cash substitutes—easily reloaded at home using a card reader and readily accepted by merchants—may make cash obsolete. When and if this happens, it will remove a major impediment to the pure play Internet model. But predictions of a "cashless" society have been made before and have yet to be fulfilled. No one knows how long it will take for U.S. consumers to willingly abandon cash.

Overhead expenditures

Economists are fond of reminding us that there is no free lunch, and eschewing physical space for cyberspace does not come without costs. A pure play Internet bank requires less physical overhead, but running a high-tech delivery system requires labor that is more highly educated and, therefore, more expensive than, say, window tellers. Unlike trade name Internet banks, pure play Internet banks cannot use the excess systems capacity of their parents for customer support, computer networks, data processing, or loan underwriting—they either must develop these systems from scratch or outsource them. And for Internet-only banks a 24-hour call center is a necessity, not a luxury, because the customers of an Internet bank expect around-the-clock business hours.

Marketing poses a particularly thorny problem. For Internet-only banks, creating a brand identity is at once more difficult (because the bank has to cut through the noise on the Internet) and more crucial (because the bank lacks physical branch locations which would otherwise help establish its presence in the marketplace). Rosen and Howard (2000) report that the average online retailer spends $26 on marketing and advertising per purchase, more than ten times the cost to brick and mortar retailers. Wingspan reportedly spent $19 million on Web advertising during a five-month period in early 2000, compared with $13 million for MBNA and $4.6 million for Fleet Boston Financial Group, both of which are larger than Wingspan but were not relying on a purely Internet distribution channel.[13] Furthermore, the effectiveness of these advertising expenditures is not clear; for example, the CEO (chief executive officer) of Bank One recently called banner ads on the Web to promote an Internet bank website "essentially worthless."[14]

Ellen Seidman, director of the Office of Thrift Supervision (OTS)—an agency that has chartered a number of Internet-only thrift institutions—summarized the overhead situation at Internet banks: "... the savings they have achieved by not having branches have often been offset by the high costs associated with acquiring and retaining customers and with updating and improving their technology infrastructure. The promise of low general and administrative expenses has yet to be proven."[15]

Performance of the Internet banking model: Research studies

Measuring the impact of the Internet on bank financial performance can be difficult, because in most cases the costs and revenues associated with Internet activities are not reported separately from the costs and revenues generated by the rest of the bank. As a result, there is little systematic evidence regarding the financial performance of the Internet banking channel. Most studies simply measure trends in market shares, numbers of accounts, market penetration rates, and similar phenomena using data from surveys of consumers, annual reports of banks, or bank press releases.

Recently, federal regulatory agencies have begun to collect data on Internet banking in a more systematic fashion. The Federal Reserve and the Office of the Comptroller of the Currency (OCC) have used their regularly scheduled safety and soundness examinations as an opportunity to ask banks about their Internet activities. Among other questions, examiners ask if the bank operates a website; whether that website is transactional; which products and services are offered on the website; whether the site is operated by an outside vendor or by the bank; and whether the bank plans to upgrade the website in the future. The resulting databases can be linked to the call report, allowing systematic financial analysis of various Internet banking strategies.

Because these databases are very new, only two studies (to my knowledge, at the time this article was prepared) have thus far used them to examine the financial performance of Internet banks. Both studies broadly define an "Internet bank" as a bank that operates a transactional website. Furst, Lang, and Nolle (2000) use a large database of national banks. They find that the typical Internet bank is more profitable than the typical non-Internet bank and tends to generate greater amounts of noninterest (fee-based) revenue; however, they find that newly chartered banks (less than one year old) that offer Internet banking tend to be less profitable than newly chartered non-Internet banks. Sullivan (2000) uses a database of commercial banks located in the Tenth Federal Reserve District. He finds that Internet banks have substantially higher ROE than non-Internet banks, although this difference is not statistically significant. He further finds that the typical Internet bank generates higher noninterest revenues, relies more on purchased funds financing, has slightly better loan quality, and (contrary to the standard Internet banking model, but consistent with the anecdotal evidence reported above) generates *higher* levels of noninterest expenses.

These studies are important, because they offer the first systematic analysis of whether banks that offer a nontrivial array of services over the Internet are more or less profitable than traditional brick and mortar banks that offer little or no services over the Internet. However, because these studies use such a

broad definition of an Internet bank, they cannot distinguish between the effectiveness of various Internet strategies, such as the pure play, trade name, and click and mortar strategies discussed above. Furthermore, because the databases these researchers have to work with do not identify the amount of business that flows through Internet channel, the banks in these studies may generate as little as 1 percent, or as much as 100 percent, of their business via the Internet. Thus, these studies do not provide (and in their defense, they do not set out to provide) a good test of the model in table 1, because most of the "Internet banks" in these studies are click and mortar banks that employ multiple distribution channels.

In contrast, this article focuses on the financial performance of pure play Internet banks only. The downside of this approach, compared with the earlier studies, is that only a small handful of pure play Internet banks have operated long enough to have established a financial record. But on the upside, this approach allows us to more accurately test the Internet model in table 1, because pure play banks generate 100 percent of their business through the Internet channel.

Identifying pure play Internet banks and thrifts

A financial institution had to meet four conditions to be included in this study as a pure play Internet bank. To start with, the institution had to be previously identified by the Federal Deposit Insurance Corporation (FDIC) as an institution whose primary contact with customers was over the Internet. The FDIC maintains an informal database of Internet activity at commercial banks and thrifts, and at the end of the third quarter 2000, there were 22 "Internet-primary" institutions in this database. Second, the institution had to produce a full range of basic banking services, including taking insured deposits, offering checking accounts, and making loans. Third, the institution had to begin its operations using a new commercial bank charter or new thrift charter. Imposing this condition excludes institutions that began their Internet-only operations using a preexisting charter, and whose assets, liabilities, costs, and revenues unavoidably reflect the preexisting physical branching strategy. Fourth, the institution had to file its first quarterly *Statement of Condition and Income* (call report) before the year 2000. Imposing this condition excludes institutions for which I could observe only one or two full quarters of financial performance.

Only six banks and thrifts met all four of these conditions. The six pure play Internet banks—Ebank, First Internet Bank of Indiana, Gay and Lesbian Bank, Marketplace Bank, NetBank, and Principal Bank—are described in box 1.[16] The other 16 banks and thrifts from the informal FDIC list are also listed in the box, along with a description of how they violated one of the conditions listed above. Although this filtering procedure excludes the majority of banks and thrifts on the initial FDIC list, for my analysis to be meaningful it must focus only on institutions that can clearly be called "pure play Internet" banks and thrifts.[17]

It is important to understand that the tests below reflect the *average* financial performance of these six pure play banks. The results in this study are not meant to imply that any single one of these six institutions performed well or performed poorly during the sample period.

Choosing an appropriate performance benchmark

This careful selection process yields an interesting byproduct: each of the six pure play Internet banks is also a newly chartered, or de novo, bank. This is an important observation, because the financial performance of de novo banks has been shown to differ systematically from the financial performance of established banks (Hunter and Srinivisan, 1990; DeYoung and Hasan, 1998; and DeYoung, 1999). To properly evaluate the financial performance of these pure play Internet banks, it is therefore essential to evaluate their performance relative to newly chartered non-Internet banks, not relative to established non-Internet banks.

Figures 1 and 2 illustrate why this is important. Figure 1 shows how a newly chartered bank's ROA improves over time relative to the average ROA for established banks. Figure 2 shows how a newly chartered bank's capital ratio (equity divided by assets) declines over time relative to the average capital ratio for established banks. Although these figures are highly stylized, they are reasonable representations of results from systematic studies of actual de novo bank performance (for example, DeYoung, 1999). In terms of ROA, the typical de novo bank substantially underperforms the typical established bank during its early years, but as the new bank matures its profitability gradually approaches the level of established banks. As shown in the figure, this maturation process—or learning curve—can take as long as a decade to run its course. A similar, albeit faster, maturation process occurs for the capital ratio, with the typical de novo bank having a substantially larger capital cushion than the typical established bank during its early years.

These learning curve effects must be taken into account to avoid misstating the financial performance of pure play Internet banks. Figure 1 shows

BOX 1

The pure players

It is common knowledge that the number of Internet banks and thrifts is increasing rapidly in the U.S. But it is less well known how few of these banks and thrifts have completely abandoned traditional distribution channels in favor of a pure play strategy of operating exclusively, or nearly exclusively, over the Internet. As of the third quarter of 2000, staff at the FDIC had identified 22 Internet-primary banks and thrifts that do business primarily over the Internet and have no branch locations. "Internet primary" is an informal designation, and is not used formally in any regulatory or supervisory matter.

Starting with the 22 institutions on the FDIC's informal list, I identified six pure play Internet banks and thrifts to include in the regression tests. Each of these six institutions had the following characteristics: 1) it produced a full range of basic banking services, including taking insured deposits, offering checking accounts, and making loans; 2) it began its operations using a new commercial bank charter or new thrift charter; and 3) it filed its first quarterly *Statement of Condition and Income* (call report) before the year 2000.

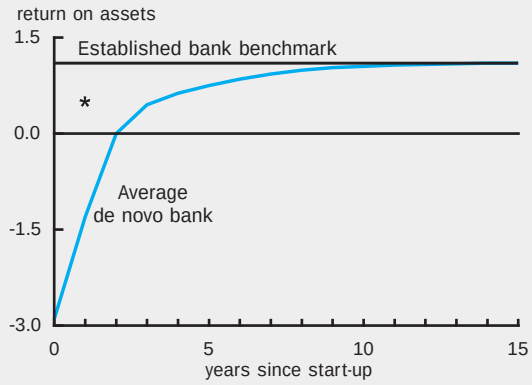
A short description of these six pure play Internet banks and thrifts follows. The accompanying financial information reflects the most current call report data available as of June 30, 2000. Other information was gleaned from informal discussions with other regulators, from the bank websites, and from the National Information Center Database.

- Ebank, www.ebank.com, established in August 1998 as Commerce Bank—a $69 million thrift institution headquartered in Atlanta, Georgia. It adopted its Internet focus in the early months of its life and changed its name to Ebank in 1999. The website has a clear focus on selling credit, transactions, and other services to small businesses. The loan portfolio is a mixture of business and real estate loans.
- First Internet Bank of Indiana, www.firstib.com, established in December 1998—a $188 million state bank headquartered in Indianapolis, Indiana. The loan portfolio is mostly real estate and consumer (non-credit-card) loans.
- Gay and Lesbian Bank, www.glbank.com, established in September 1999—a $41 million thrift institution headquartered in Pensacola, Florida. The bank's mission is to help ensure discrimination-free access to financial products and services, such as mortgage loans for unmarried couples. The loan portfolio is about evenly split among real estate, consumer, and business loans.
- Marketplace Bank, www.marketplacebank.com, established in October 1999—a $465 million national bank headquartered in Maitland, Florida. The bank is owned by Amicus Federal Savings Bank, which itself is owned by Canadian Imperial Bank of Commerce. It operates Internet kiosks (which combine ATMs, telephones, and Internet terminals) in large grocery store chains. The loan portfolio is almost exclusively real estate loans.
- NetBank, www.netbank.com, established in August 1997 as Atlanta Internet Bank—a $1.5 billion thrift institution headquartered in Alpharetta, Georgia. It changed its name to NetBank in 1998. The loan portfolio is almost exclusively real estate loans.
- Principal Bank, www.principal.com, established in February 1998—a $182 million thrift institution headquartered in Des Moines, Iowa. It is affiliated with the Principal Financial Group, which also includes life insurance, financial services, and mortgage banking subsidiaries. The loan portfolio is mostly real estate loans, mixed with some consumer loans.

I excluded the remaining 16 banks and thrifts on the FDIC's informal list for a variety of reasons. A large number of the excluded institutions were chartered after 1999 and had not yet established a financial performance record long enough to be included in the tests. This group includes Bank of Internet, DeepGreen Bank, Echarge Bank, EOS Bank, ING Bank, Lighthouse Bank, TB Bank, and Virtual Bank. Other excluded institutions are "limited purpose banks" that either choose not to offer a full range of banking services or are limited by their charter type from doing so. This includes CompuBank and BMW Bank. Another set of excluded institutions started up by taking over existing bank or thrift charters; in some of these cases a clear date on which these institutions began their pure play Internet strategy could not be identified, and in any event the performance of these institutions could be affected by the residue from their former business strategies. This group includes ClarityBank.com, E*trade Bank, Nexity Bank, and Next Bank. One excluded institution, Security First Network Bank, changed ownership and strategy after receiving its charter. Another excluded institution, Millennium Bank, did not yet have a functioning interactive website at the time this article was prepared.

FIGURE 1

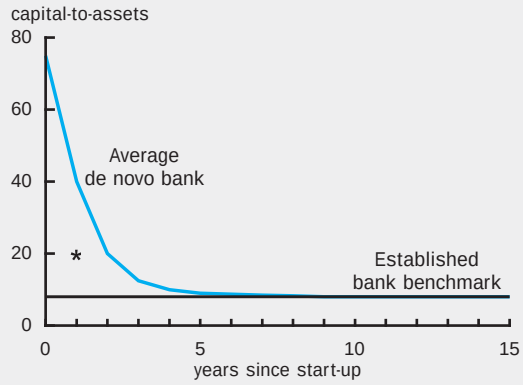
Typical time trend for ROA at a newly chartered bank



* Indicates a hypothetical Internet bank.

FIGURE 2

Typical time trend for capital-to-assets at a newly chartered bank



* Indicates a hypothetical Internet bank.

why. Assume that the asterisk located at about ROA = 0.50 percent represents the ROA of a hypothetical one-year-old pure play Internet bank. (I present some actual ROA data for pure play Internet banks later in this article.) Is this good performance or bad performance? Compared with the ROA of the typical established bank, say around 1.20 percent, this would be a poor performance. But such a comparison would understate the profitability of the pure play Internet bank because it ignores the de novo bank learning curve—that is, it does not separate the financial effects of "newness" from the financial effects of "pure playing." The more appropriate benchmark is the ROA of –1.00 percent generated by the typical one-year-old bank. Compared with this more appropriate benchmark, the hypothetical one-year-old Internet bank would be performing well.

Similarly, assume the asterisk in figure 2 represents the capital ratio of a hypothetical one-year-old pure play Internet bank, about 20 percent. (I present some actual capital ratio data for pure play Internet banks later in this article.) Is this a large capital cushion or a small capital cushion? Compared with the established bank benchmark of 8 percent, this would be a large capital cushion. But such a comparison may overstate the safety and soundness of the pure play Internet bank. The more appropriate benchmark, *ceteris paribus*, is the capital ratio of about 40 percent for the typical one-year-old bank. Compared with this benchmark, the hypothetical one-year old Internet bank would have a relatively small capital cushion.

Similar learning curve patterns exist for other measures of de novo bank financial performance. DeYoung (1999, p. 22) shows that overhead costs, interest revenues, noninterest revenues, and deposit funding at new banks start out worse than established banks but gradually improve over time, while asset growth, equity cushions, and loan quality start out better than established banks but deteriorate over time.

By estimating the following equation for a suitable data set of newly chartered banks, I can test how using a pure play Internet strategy affects the financial performance of banks and thrifts, while at the same time controlling for the effects of "newness" on the financial performance of these firms:

1) $$\textit{financial performance}_{i,t} = \alpha + \beta \times \textit{pure play}_{i} + \gamma \times \ln(\textit{bank age}_{i,t}) + \delta \times \textit{control variables}_{i,t} + \varepsilon_{i,t}.$$

I estimate equation 1 using time-series cross-section data so that each bank or thrift can be observed at different stages of its early development. The subscript i is an index that identifies individual banks, and the subscript t is a time index that represents calendar quarters. On the left-hand-side, *financial performance* takes on the value of a variety of different financial performance ratios (such as return on assets, equity to assets, or asset growth rate) in different regressions. On the right-hand-side, *pure play* is a binary variable equal to one if the bank uses the pure play Internet strategy, and equal to zero otherwise. The variable *bank age* measures the age of a bank or thrift in calendar quarters. This variable controls for the variation in financial performance due to the learning curve effects illustrated in figures 1 and 2, and specifying this variable as a natural log allows the estimated relationship to closely reflect the curve-linear shapes shown in those figures.[18] Similarly, *control variables* are a collection of variables that control for exogenous influences on financial performance, such as local

economic conditions, thrift or national bank status, organizational form, fixed time effects, and quarter dummies.

Because equation 1 holds constant the effects of newness (*bank age*) and other factors (*control variables*), the coefficient β on the *pure play* variable provides a controlled test of whether the financial performance of pure play Internet banks is better, similar, or worse than the financial performance of non-Internet banks. In terms of figures 1 and 2, the sign (positive or negative) of this coefficient indicates whether the asterisks are above or below the de novo bank learning curves. A more detailed description of equation 1 appears in the appendix.

The data set

The time-series cross-section data set includes data for two groups of institutions: the six pure play Internet banks and thrifts described above and 522 "benchmark" banks and thrifts. Like the pure play banks and thrifts, the benchmark banks and thrifts are all located in urban markets, and all are de novo institutions that started their operations in either 1997, 1998, or 1999.[19]

I observe financial information for these institutions each quarter over a 13-quarter window from 1997:Q2 through 2000:Q2. I begin with 1997:Q2 because I exclude data from the start-up quarters—institutions typically operate for less than 90 days during their start-up quarters, and the financial statements reported for these quarters tend to contain low-quality data. The final quarter in the window is 2000:Q2 because this was the most recent data available at the time this article was prepared. The data set is an unbalanced panel. Institutions that started up in 1997:Q1 were observed as many as 13 times, and institutions that started up in 1999:Q4 were observed only twice. Some institutions did not last until the end of the 13-quarter window due either to acquisition or failure. In all, the data set includes 3,263 quarterly observations (38 for the pure play banks and thrifts and 3,225 for the benchmark banks and thrifts). The average pure play observation was 4.45 quarters old, and the average benchmark observation was 4.74 quarters old. Additional details about the data set are included in the appendix.

Regression test results

I estimate 17 different versions of equation 1, applying ordinary least squares (OLS) techniques to the data panel described above. Each of the rows in table 2 reports results from a different regression, and each regression uses a different *financial performance*

TABLE 2

Selected OLS regression results from equation 1

Performance variable	Mean for benchmark banks[a]	Pure play mean vs. benchmark mean (using estimated β)[b]	Change as average bank ages one quarter (using estimated γ)[b]	R^2
Return on assets	–1.36	1.76 lower***	+0.31***	0.3940
Return on equity	–4.61	6.87 lower***	+1.01***	0.2793
Book value of physical assets/assets	3.60	0.85 lower***	–0.11***	0.1817
Expense on physical assets/assets	0.82	0.12 higher	–0.03***	0.2550
Expense on labor/assets	2.52	0.45 higher*	–0.10***	0.3149
Employees per $million assets	0.53	0.007 higher	–0.015***	0.2943
Salary and benefits/employees	$49,005	$7,165 higher*	–$547***	0.2406
Noninterest expense/assets	5.06	1.65 higher***	–0.21***	0.3108
Average deposit interest rate	3.46	0.13 lower	+0.05***	0.2480
Deposits/assets	76.65	12.39 lower***	+1.58***	0.3304
Average loan interest rate	7.66	1.00 lower**	+0.19***	0.4898
Loans/assets	56.53	5.09 lower	+2.04***	0.2420
Nonperforming loans/loans	0.16	0.14 lower***	+0.21***	0.0502
Interest margin/assets	3.63	0.18 higher	+0.05***	0.3505
Noninterest income/assets	0.71	0.76 lower***	+0.03***	0.1020
Annual asset growth rate	94.06	43.97 higher*	–14.59***	0.3275
Equity/assets	19.42	14.77 higher***	–1.56***	0.4916

[a]Results are in annual percent terms, unless stated otherwise.
[b]Results are in percentage points, unless stated otherwise.
Notes: Each row displays results from a separate regression. Data are an unbalanced panel of 3,263 quarterly observations of 528 banks and thrifts between 1997:Q2 and 2000:Q2. The *, **, and *** indicate statistical significance at the 10 percent, 5 percent, and 1 percent levels, respectively, for the estimated coefficients β and γ.

ratio as the dependent variable. The first column reports the financial performance for the average benchmark bank. The second column reports the financial performance of the average pure play bank relative to the average benchmark bank, based on the estimated value of coefficient β in each regression. The third column reports the change in financial performance of the average sample bank as it grows one quarter older (from approximately five quarters old to six quarters old), based on the estimated value of coefficient γ in each regression. All of the regressions were estimated using quarterly data, but the results in table 2 are reported in annualized terms.

Because there is only a small number (38) of pure play observations in the data set, the significance levels, indicated by asterisks in the table, are only suggestive of statistical precision, and should be interpreted with caution.[20] The coefficient estimates themselves, however, are unbiased estimates. Overall, the multiple regression tests performed here are a useful way to evaluate the performance of pure play banks after controlling for a large number of exogenous influences represented on the right-hand-side of equation 1. Full regression results are available upon request from the author.

The coefficient γ on ln(*bank age*) is statistically significant at the 1 percent level in all 17 regressions. This indicates that all aspects of financial performance are in the process of evolving at the typical five-quarter-old bank in this data set. Return on assets, return on equity, rates paid on deposits, total funding from deposits, rates charged on loans, total investment in loans, nonperforming loan ratios, overall interest margins, and the portion of income generated from noninterest activity are all on the increase as these banks mature. On the other hand, the book value of physical assets, spending on physical assets, total labor expenses, workers per million dollars of assets, average compensation, noninterest expenses, asset growth rates, and equity capital cushions are all on the decrease as these banks mature. These results are consistent with the previous research cited above on the evolution of financial performance at newly chartered banks. Furthermore, these results suggest that the primary regression test—that is, the coefficient β on the *pure play* variable—can be interpreted knowing that significant controls are in place to absorb the effect of learning curves on the financial performance of new banks.

The coefficient β is statistically significant in 12 of the 17 regressions. Most importantly, this coefficient is negative and highly significant in the profitability regressions in the first two rows of the table. Thus, after controlling for bank age and other influences on bank performance, pure play Internet banks and thrifts earned lower profits than banks that used more traditional distribution channels. The estimates suggest that ROA and ROE at the average five-quarter-old pure play Internet bank were, respectively, 176 basis points and 687 basis points lower than the ROA and ROE at the typical five-quarter-old benchmark bank. This is consistent with the findings of Furst, Lang, and Nolle (2000) for (non-pure-play) de novo Internet banks. The remaining regressions contain prescriptive evidence for why profitability is relatively lower at the pure play banks.

Do the regressions provide evidence that overhead spending at pure play Internet banks is relatively low, a central tenet of the Internet banking model in table 1? Consistent with the model, the book value of physical assets at pure play Internet banks was significantly lower than at the benchmark banks. However, ongoing expenditures on physical assets were not lower, perhaps reflecting a tradeoff between lower spending on branch locations but higher ongoing spending on technology.[21] Furthermore, spending on labor—a substantial component of which is nonvariable overhead spending—was significantly higher at the pure play banks. These high labor expenses appear to be associated with relatively high salaries and benefits, not excessively large numbers of employees. The average pure play bank paid its employees about $7,000 more per year than the average benchmark bank.

These results suggest a nontraditional overhead structure at the pure play Internet banks, featuring less physical overhead but more highly paid (and presumably more highly skilled) workers. This overhead structure generates substantially higher noninterest expenses. These high noninterest expenses include some unknown amount of spending on marketing and advertising. Unfortunately, it is not possible to test whether the pure play banks incurred higher marketing expenses than the benchmark banks—as suggested by the anecdotal evidence presented above—because marketing expenses are not reported separately in the call reports.

Do the regressions support the other central feature of the model in table 1, that pure play Internet banks pay systematically higher interest rates to depositors or charge systematically lower rates to borrowers? The regressions show no significant difference in average deposit rates between the pure play and benchmark samples. This is consistent with the anecdotal evidence that Internet banks periodically offer deposit products with high interest rates, but

that deposit rates are not systematically higher across all deposit products. In contrast, the regressions show that the average loan interest rate is about 100 basis points lower at the pure play banks than at the benchmark banks. This result must be interpreted with some caution, as it may simply indicate that the pure play banks in this sample made lower risk loans. Indeed, the nonperforming loan ratio is relatively low at the pure play banks, suggesting that this may be the case.

Consistent with the results of Sullivan (2000), the pure play banks in this sample had difficulty attracting deposit funding. For the average pure play bank, the deposits-to-assets ratio is over 12 percentage points lower than at the average benchmark bank. This funding shortfall is offset by higher levels of expensive equity capital: The equity-to-assets ratio at the average pure play bank was nearly 15 percentage points higher than at the average benchmark bank. There is no significant difference in the loans-to-assets ratios between the two sets of banks. Combining the effects of loan levels, deposit levels, loan rates, and deposit rates, there is no significant difference in net interest margins across the two sets of banks.

In addition to their relatively high noninterest expenses, the pure play banks had significantly lower noninterest income ratios than the benchmark banks. This suggests that it is difficult to cross-sell fee-based financial products to loan and deposit customers over a distribution channel that minimizes person-to-person contact. This is consistent with the notion that a large portion of Internet banking customers do not view the Internet bank as their main financial institution.

Finally, do the regressions provide evidence that pure play Internet banks—unencumbered by physical location and able to reach across geographic boundaries via the Internet—grow faster than more traditional banks? The regressions confirm this conventional wisdom. Assets at the pure play banks grew at a substantially faster rate than assets at the benchmark banks, more than 40 percentage points faster per year. This torrid asset growth rate, combined with the deposit funding problems intrinsic to this business model, helps explain why the pure play banks have below average deposit-to-assets ratios. The rapid asset growth rate also helps explain why these banks hold above average capital ratios, which are needed not only to fund fast growth, but also to absorb the large initial losses that these banks generate. For these reasons, federal and state chartering authorities typically require higher levels of start-up capital for de novo Internet banks than for traditional de novo banks.

Conclusion

The results of this article should be interpreted carefully. On one hand, I find statistical evidence of poor financial performance at pure play Internet banks and thrifts. On the other hand, this evidence is based on a small number of newly chartered banks and thrifts that are struggling with two different learning curves: They are passing through the financial maturation process common to all de novo banks, and they are pioneering the use of a new business model. Although my empirical framework carefully controls for the effects of the first of these two learning curves, the newness of the pure play business model precludes me from controlling for the effects of the second of the two learning curves.

Putting these potential limitations aside for the moment, the tests indicate that the average pure play Internet bank in my data set was less profitable than the average branching bank of similar age and circumstance. The tests also imply the existence of two fallacies about the Internet banking model: that this strategy does not necessarily reduce overall overhead expenses, and that banks that use this strategy do not necessarily pay higher overall interest rates on deposits.

I find that pure play Internet banks tend to have relatively low physical overhead, chiefly due to not operating brick and mortar branches. However, I find relatively high levels of other noninterest expenses, chiefly related to labor costs, which more than offset any expense savings from lower physical overhead. Contrary to anecdotal evidence, I find no evidence that pure play Internet banks pay higher than average deposit rates on a systematic basis. My results also suggest that the Internet-only distribution strategy used by these banks makes it difficult to cross-sell fee-based financial products to their loan and deposit customers, depressing revenue growth and contributing to their low profitability. Despite these troubles, I find evidence that pure play banks grow faster than non-Internet banks at similar stages of development. On average, rapid asset growth outstrips these banks' ability to raise deposit funding, requiring large amounts of expensive equity capital funding to fuel their growth.

While these results are based on historical data from 1997 through 1999, they are consistent with more recent reports in the banking press about the difficulties of "going virtual." During the first week of 2001 alone, two Internet-only banks announced measures to boost their lagging profits. First Internet Bank of Indiana announced it was laying off 20 percent

of its already small work force in an effort to cut overhead expenses, and WingspanBank.com announced changes in checking account fees and interest rates in an effort to enhance noninterest revenues and interest margins.[22] Moreover, the financial performance of pure play Internet banks captured here is reminiscent of the financial performance often observed for many non-financial Internet firms: rapid growth but low (or negative) profits.

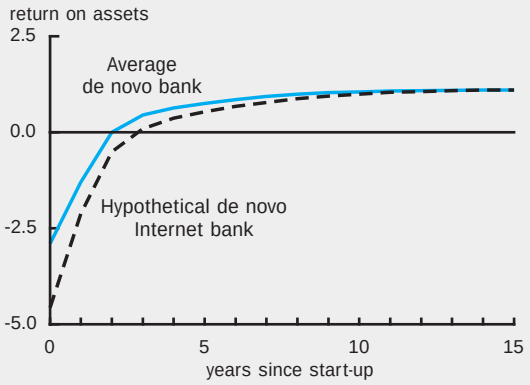
Limitations of this article

Proponents of e-commerce typically respond that virtual business models are financially sound, but that the path to profitability is simply longer than in brick and mortar business models. It is certainly possible that the pure play Internet banks and thrifts in this data set are too young to have fully exploited the advantages of the business model. As illustrated in figure 3, the learning curve for de novo Internet banks may simply be longer and flatter than for traditional de novo banks. If this is the case, then in the long run, the average bank examined in this article will eventually earn profits equal to or exceeding those generated by more traditional distribution strategies. For example, the CEO of Principal Bank recently reaffirmed his bank's intentions to remain a pure play Internet bank and not add branches: "If you have a solid business plan, you can remain focused and it's not necessary to change."[23]

Furthermore, this article evaluates the financial performance of pure play Internet banks to the exclusion of other Internet banking strategies. As such, the results generated here may have limited implications for the financial performance of Internet banks that use, say, the click and mortar strategy. By combining several distribution channels, banks might offer Internet banking while at the same time avoiding some of that channel's biggest problems, like the high costs of marketing, the costs associated with ATM subsidies, and the reluctance of customers to commit to primary relationships with a purely Web-based bank. Regulatory authorities may give banks and thrifts an additional push in this direction: Concerned about high growth rates but low profitability, chartering authorities are requiring increasingly higher levels of initial capitalization for applicants that seek charters for pure play start-ups.

FIGURE 3

Hypothetical time trends for ROA at newly chartered Internet and non-Internet banks



The Internet remains an emerging technology in the banking industry. In the short period between the preparation and publication of this article, it is likely that new technologies will have become available to banks; new Internet strategies will have been invented, launched, and perhaps abandoned; and the results of new studies will have been announced. As time passes, and more than six banks and thrifts meet the definitional requirements of a "pure play Internet bank" used in this article, the empirical testing performed here can be expanded to include more institutions, as well as a greater number of quarterly observations for each institution.

APPENDIX

Data and regression details

The regression tests used an unbalanced data panel of 3,263 quarterly observations of 528 banks and thrifts for the 13 quarters between 1997:Q2 and 2000:Q2. This includes 38 observations of six pure play Internet banks and thrifts and 3,225 observations of 522 benchmark banks and thrifts. Table A1 displays selected descriptive statistics for these two groups of banks and thrifts.

All banks and thrifts were located in urban markets (metropolitan statistical areas), and all began their operations with new bank or thrift charters in either 1997, 1998, or 1999. Flow variables are measured as quarterly values, stock variables are measured as quarter-end values, and all dollar values are measured in year-end 1999 dollars. I excluded from the data any bank or thrift that did not make loans, did not hold deposits, or held large concentrations of

TABLE A1

Summary statistics for data in regression tests

	Benchmark		Pure play	
	Mean	Standard deviation	Mean	Standard deviation
AGE (quarters)	4.74	3.03	4.45	2.79
ASSETS ($000s)	64,780	232,567	267,491	396,002
EMPLOYGROWTH (%)	11.18	3.84	10.94[a]	—[a]
THRIFT	0.0719	0.2584	0.7894	0.4132
OCC	0.2232	0.4165	0.0526	0.2263
MBHC	0.1854	0.3887	0.0526	0.2263
REALESTATE	0.6127	0.2212	0.7838	0.1883
BUSINESS	0.2767	0.1874	0.0912	0.1193

[a]For the pure play banks and thrifts, EMPLOYGROWTH is set equal to the national average during the sample period.
Note: There are 3,225 quarterly observations (522 banks) in the benchmark sample and 38 quarterly observations (six banks) in the pure play sample.

credit card loans that exceeded 25 percent of total loans. I deleted selected quarterly observations if they had unrealistic values for any of the financial performance variables. In addition, because quarterly accounting revenue and expense data can fluctuate in patterns that are not representative of actual financial performance, I truncated the value of all financial performance variables used on the left-hand-side of the regressions at the 1st and 99th percentiles of their sample distributions.

The full regression specification used in these tests is:

$$
\begin{aligned}
2)\quad PERFORMANCE_{i,t} &= \alpha \\
&+ \beta \times PUREPLAY_i + \gamma \times \ln(AGE_{i,t}) \\
&+ \delta_1 \times \ln(ASSETS_{i,t}) + \delta_2 \times EMPLOYGROWTH_i \\
&+ \delta_3 \times THRIFT_i + \delta_4 \times OCC_i + \delta_5 \times MBHC_i \\
&+ \delta_6 \times REALESTATE_{i,t} + \delta_7 \times BUSINESS_{i,t} \\
&+ \delta_8 \times YEAR98_t + \delta_9 \times YEAR99_t \\
&+ \delta_{10} \times YEAR00_t + \delta_{11} \times QTR1_t \\
&+ \delta_{12} \times QTR2_t + \delta_{13} \times QTR3_t + \varepsilon_{i,t}.
\end{aligned}
$$

Equation 2 is simply a detailed specification of equation 1 from the text. *PERFORMANCE* represents the financial performance of bank *i* at time *t*, based on a different financial ratio in each of the 17 estimated regressions. (These 17 financial performance variables are displayed in table 2.) *PUREPLAY* is a dummy variable equal to one if bank *i* is a pure play Internet bank. *AGE* measures bank *i*'s age in quarters at time *t*. *ASSETS* measures the size of bank *i* at time *t* in terms of assets. *EMPLOYGROWTH* measures the cumulative percentage increase in employment in the bank *i*'s home state between 1996 and 1999. (This variable is set equal to the national average for the pure play banks, which have no home geographic market.) *THRIFT* is a dummy variable equal to one if bank *i* is a thrift institution. *OCC* is a dummy variable equal to one if bank *i* is a commercial bank with a national bank charter. *MBHC* is a dummy variable equal to one if bank *i* is an affiliate in a multibank holding company. *REALESTATE* and *BUSINESS* measure that percentage of bank *i*'s loan portfolio comprised of real estate loans and business loans, respectively, at time *t*. *YEAR98*, *YEAR99*, and *YEAR00* are dummy variables equal to one for observations that occurred in 1998, 1999, and 2000, respectively. *QTR1*, *QTR2*, and *QTR3* are dummy variables equal to one for observations that occurred in the first, second, and third calendar quarters, respectively. The residual term $\varepsilon_{i,t}$ is assumed to be distributed normally with zero mean.

NOTES

[1]The information in this paragraph came from conversations with Federal Deposit Insurance Corporation (FDIC) staff; The Financial Times, Limited (2000) (based on data from ING); and The McGraw-Hill Companies Inc. (2000) (based on data from McKinsey & Company).

[2]The source for the numbers of banks and branches is the FDIC website. The sources for the number of ATMs are the American Bankers Association, Bank Network News, Ernst & Young, and Dove Associates.

[3]For example, Bank of America recently announced that most of its 14,000 ATMs will be retrofitted to become "automated banking machines," or ABMs.

[4]The sources for these numbers are Nathan (1999) (based on a survey by Booz, Allen & Hamilton) and The Economist Newspaper Limited (2000) (based on data from Jupiter Communications).

[5]Thomson Financial Media (2000) (based on data from McKinsey & Co.).

[6]There is an alternative interpretation of the third column: Because the hypothetical Internet bank has fewer physical locations to service its customers, it has to pay a higher rate to retain its existing depositors or it has to charge a lower rate to retain its existing borrowers. Note that this would leave the bank with the same profitability levels as the brick and mortar bank, but without the higher growth opportunities envisioned by advocates of the Internet model.

[7]Thomson Financial Company (2000h).

[8]Thomson Financial Company (2000g) (based on data from Coldwell Banker and Forrester Research).

[9]The sources are Thomson Financial Company (2000d) (based on data from FinanCenter.com) and Forbes Inc. (2000).

[10]Thomson Financial Company (2000f).

[11]Thomson Financial Company (2000i) (based on data from First Manhattan Consulting Group).

[12]Thomson Financial Company (2000b).

[13]Thomson Financial Company (2000e) (based on data from AdRelevance).

[14]Thomson Financial Company (2000a).

[15]Thomson Financial Company (2000c).

[16]The contents of this informal FDIC database are not in the public domain. There are other lists of Internet banks in the public domain, but the institutions on these lists vary because there is no standard definition of an "Internet" bank. A public source that uses a very broad definition is *Online Banking Report* (www.onlinebankingreport.com), which lists over 1,500 "true Internet banks and credit unions."

[17]In the preliminary tests leading up to this article, I estimated a similar set of regressions using a larger set of nine banks and thrifts that were chosen using a less stringent set of filters. The results from those preliminary regressions were quite similar to the results reported here in table 2.

[18]I also estimated regressions using the inverse of bank age in place of the natural log of bank age. The basic results were unchanged in those regression tests.

[19]The 16 excluded banks and thrifts from the informal FDIC database are not included in either of these two samples.

[20]These significance tests were constructed using White's estimator for the standard errors.

[21]The call reports do not separate quarterly expenses on physical plant from quarterly expenses on equipment.

[22]Thomson Financial Company (2001).

[23]Thomson Financial Company (2000b).

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