

The financial progress of pure-play internet banks

Robert DeYoung¹

1. Introduction

The internet has become a major distribution channel for US banks. Most internet banks use a “clicks and mortar” banking model, which deploys transactional websites in conjunction with traditional bricks and mortar branches. Only a handful of banks use a stand-alone, “internet-only” banking model in which websites are the sole delivery channel.

To date, most internet-only banks have struggled for profitability. These difficulties contrast with relatively recent predictions that they would come to dominate traditional branching banks. According to the standard internet-only business model, low overhead expenses and access to larger geographic markets should allow internet-only banks to offer better prices (higher deposit rates, lower loan rates) than branching banks, grow faster than branching banks, and still earn normal profits. However, in practice the number of physical branch locations is growing, not shrinking. US commercial bank branches increased by about 10,000 during the 1990s, even as the number of US commercial banks declined by about 4,000.

But this emerging conventional wisdom - that the internet-only banking model is not viable - may be premature. As internet-only banks age, they accumulate experience with this new business model which may allow them to run it more efficiently in the future. Moreover, as internet-only banks grow larger, they may generate scale economies in excess of those available to traditional banks that use less capital-intensive production and distribution technologies. If these effects are substantial, internet-only banks may be able to close the performance gap with traditional banks.

2. Literature on experience effects and scale effects

“Experience” can be an important determinant of cost and production efficiency. Experience is usually measured by accumulated production volume over time, starting from the initial unit produced. Holding production technology and firm size constant, as a firm accumulates experience using the technology, its unit costs will fall. Gemawat (1985) reviews this concept.

Experience effects have not been extensively measured in banking. But a handful of studies have measured the rates at which the financial performance of newly chartered, or de novo, banks improves over time. For example, DeYoung and Hasan (1998) found that the typical de novo bank takes about nine years to become as profitable as an established bank, and that over half of this improvement occurs during the first three years. Under certain conditions, time paths like these can be interpreted as implicit experience curves, because they use the passage of time to indirectly measure the accumulation of experience.

Most internet-only banks are de novo banks. Both Sullivan (2000) and Furst et al (2000) found that newly chartered internet banks earn lower profits than newly chartered non-internet banks. However, these studies based their results on data that contained mostly clicks and mortar internet banks. DeYoung (2001a) studied six internet-only banks chartered between 1997 and 1999, and found that the average one-year-old internet-only bank earned significantly lower profits than the average one-year-old traditional bank, primarily due to low business volumes and high non-interest expenses.

¹ Economic advisor and senior economist, Federal Reserve Bank of Chicago, 230 South LaSalle Street, Chicago, IL 60604, 1-312-322-5396, robert.deyoung@chi.frb.org. The views expressed here are those of the author and do not necessarily reflect the views of the Federal Reserve Bank of Chicago or the Federal Reserve System.

There is a rich literature on commercial bank scale economies that has been surveyed a number of times elsewhere (eg Evanoff and Israilevich (1991), Berger et al (1993), Berger et al (1999)). Currently, there is a debate in this literature over whether the very largest banks enjoy increasing returns to scale. However, this debate is irrelevant for this study, because the newly chartered banks examined here are substantially smaller than the minimum efficient scale estimates in any contemporary study.

3. My current research and this paper

This paper summarises a number of results from my research in progress on internet-only bank performance (see DeYoung (2001a,b,c)). I propose that three separate experience processes may be operating at new internet-only banks.

The first of these processes is the maturity experience effect. As a new bank ages and its employees and managers accumulate general banking experience, the maturity effect transforms this experience into improved financial performance. This transformation could occur through improvements in numerous aspects of financial performance, such as cost control, risk management, marketing, or pricing policies. Note that this process is common to all newly chartered banks, regardless of their distribution strategy.

The second of these processes is the technology experience effect. This process is specific to banks that are using a new and non-standard technology, such as the internet-only business model. As these new banks age and their employees, managers and perhaps even their customers accumulate experience with the new technology, the technology effect transforms this experience into improved financial performance. Note that these technology-based experiences are in addition to the general banking experience that drives the maturity experience effect.

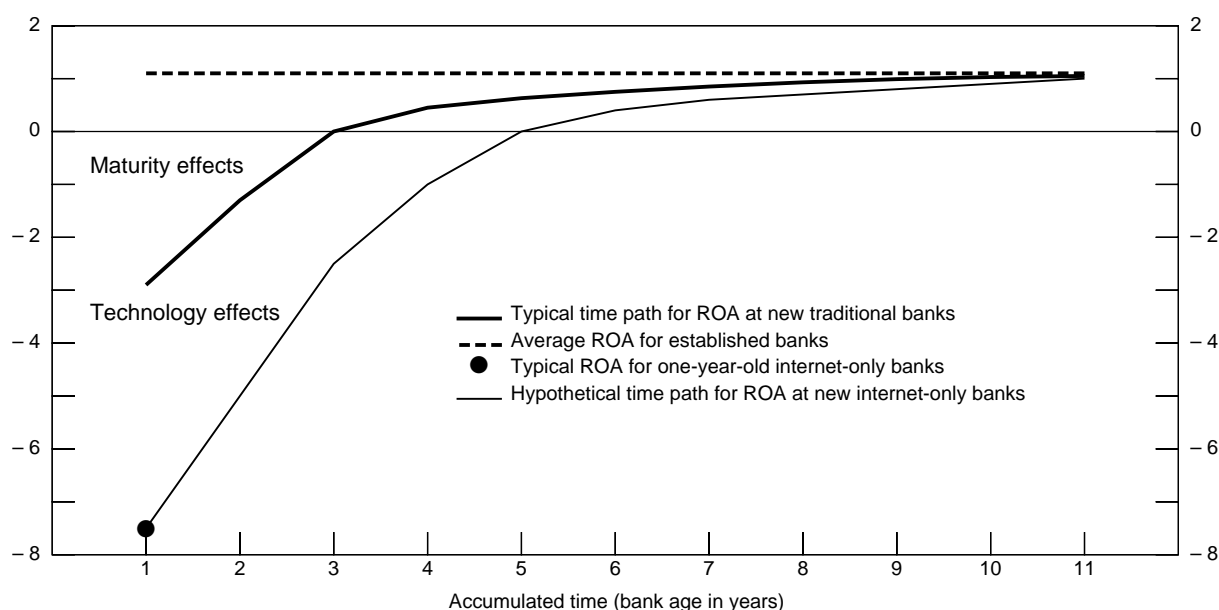
The third of these processes is the technology-specific scale effect. This process is also specific to banks that are using a new and non-standard technology. As these banks grow larger, the technology-specific scale effect transforms increased size into improved financial performance, primarily through reductions in unit costs. Note that these technology-based scale economies are in addition to any scale economies derived from the standard production technology used by traditional banks.

If only maturity-based effects exist, financial performance at new internet-only banks will improve at the same rate as traditional start-up banks over time, preserving the current performance gap. But if technology-based effects exist, financial performance at new internet-only banks could improve faster than at traditional start-up banks, narrowing or perhaps closing the performance gap.

These three propositions are illustrated in Figure 1, where accumulated time (bank age) on the horizontal axis indirectly measures accumulated experience. It shows the return on assets (ROA) for the typical de novo bank gradually approaching mature bank ROA levels over time. The diminishing gap between these two lines is driven by the maturity experience effect, as accumulated age and experience (in addition to increased scale) are transformed into improved financial performance. This general relationship is based on previously documented performance patterns of de novo commercial banks (DeYoung, (1999)).

The black dot at Age=1 illustrates that internet-only banks are typically much less profitable than traditional banks at this age. The line running through the black dot - just one of many possible hypothetical time paths for the ROA of internet-only banks - assumes that internet-only ROA will improve quickly over time. The diminishing gap between these two time paths is driven by the technology experience effect and the technology-specific scale effect, as accumulated age, experience and increased scale are transformed into improved financial performance. My current research tests whether this gap is actually closing over time as suggested in the figure.

Graph 1
Time paths for ROA at newly chartered banks



4. Sample selection and data

I compare the performance of two samples of banks: newly chartered internet-only institutions and newly chartered traditional institutions.

To be included in the internet-only sample, banks had to meet four conditions. First, these institutions could not operate any full-service branch locations, and their primary contact with their customers had to be over the internet. Second, the institution had to begin its operations using a new charter in 1997, 1998, 1999 or 2000. (This condition was relaxed in the case of two charter conversions where it was clear from the data that the enterprise was starting afresh with a new, internet-only strategy and spillover effects from the pre-existing bank were minimal). Third, the institution had to provide a full range of basic banking services, including taking insured deposits, offering chequing accounts and making loans. Fourth, the institution had to hold less than \$100 million in assets at end of its first full quarter of operation.

This resulted in a sample of 10 internet-only banks: Bank of Internet USA, ClarityBank.com, Ebank, First Internet Bank of Indiana, G & L Bank, Lighthouse Bank, NetBank, Nexity Bank, Principal Bank and The Bancorp.com Bank. (Note that “trade name” internet banks were excluded from consideration. Trade name banks use the internet-only business model but do not hold separate bank charters and do not file separate financial statements like traditional banks. WingspanBank.com, which is owned and operated by Bank One, is a well known example).

The appropriate performance benchmark for new internet-only banks is the financial performance of other newly chartered banks, not the financial performance of established banks. The benchmark performance sample contains all newly chartered traditional (ie not internet-only) banks in urban geographic markets that met the second, third and fourth conditions listed above. Rural banks were excluded because they service agriculture-driven local economies, and as a result produce product mixes quite different from those of internet-only banks.

The combined data set is an unbalanced panel of 3,700 quarterly observations of 579 banks over a 15-quarter window from 1997 Q2 to 2000 Q4. Start-up quarters are excluded, because banks typically operate for less than 90 days during them. The data panel is unbalanced because newly chartered institutions started up at different times during the 15-quarter window, because a small number of the newly chartered traditional banks were acquired during the sample period, and because I observe the financial performance of the sample banks for the first nine full quarters of their lives. The last condition is imposed because only two of the internet-only banks were more than nine quarters old at the end of the sample period. As I am measuring performance time paths in this research, I must

make sure that the right-hand ends of any estimated time paths are not determined by only a few banks.

5. Regression framework

I use multivariate regression analysis to compare the financial performance of the new internet-only banks to the financial performance of the new traditional banks. The regression framework includes two types of analysis. A static analysis tests for cross-sectional differences in the performance of the two sets of banks over the entire 1997-2000 period. A dynamic analysis tests for differences in the intertemporal performance of the two sets of banks as they grow older and larger. Various measures of financial performance are regressed on the age of the banks, the size of the banks, an intercept shift dummy for internet-only banks, various interaction terms and a vector of control variables. In all, 18 different measures of financial performance are used as dependent variables in separate regressions. The base regression specification is:

$$\begin{aligned} Performance_{i,t} = & \alpha + \beta_1 * InAge_{i,t} + \beta_2 * InAssets_{i,t} + \beta_3 * Internet Bank_i + \beta_4 * Internet Bank_i * InAge_{i,t} \\ & + \beta_5 * Internet Bank_i * InAssets_{i,t} + \beta_6 * State Job Growth_i + \beta_7 * MBHC_i + \beta_8 * \%C\&I_{i,t} \\ & + \beta_9 * \%RealEstate_{i,t} + \beta_{10} * Thrift_i + \beta_{11} * OCC_i + \beta_{12} * Year Dummies_t + \beta_{13} * Quarter Dummies_t + e_{i,t} \quad (1) \end{aligned}$$

where i indexes bank-level observations and t indexes time.

The dependent variable *Performance* takes on 18 different definitions of financial performance (ROA, ROE, etc). $InAge_{i,t}$ is the natural log of the age (in calendar quarters) of bank i in quarter t , which is a proxy for accumulated production experience. $InAssets_{i,t}$ is the natural log of bank assets for bank i in quarter t . This variable controls for differences in accumulated experience not accurately captured by *Age*, and it also provides a test for the effects of increased scale on bank performance. *Internet Bank_i* is a dummy variable equal to 1 for internet-only banks.

I estimate several versions of equation (1). First, I estimate the equation with the restrictions $\beta_4 = \beta_5 = 0$. In this specification, if β_3 is significantly different from zero, then the financial performance of the internet-only banks is either better or worse (depending on the sign of β_3) than the financial performance of the traditional banks, at the means of the data. These restrictions assume a single performance time path for all banks, ie that all newly chartered banks benefit from an identical maturity experience effect, and that newly chartered internet-only banks do not benefit from any additional technology-based experience or scale effects.

Second, I estimate equation (1) only with the restriction $\beta_5 = 0$. This allows separate maturity-based and technology-based experience effects for internet-only banks. In this specification, if β_4 is significantly different from zero, then new internet-only banks have a different performance time path than new traditional banks, holding scale constant.

Third, I estimate equation (1) only with the restriction $\beta_4 = 0$. This allows separate maturity-based and technology-based scale effects for internet-only banks. In this specification, if β_5 is significantly different from zero, then new internet-only banks have a different scale economy paths than new traditional banks, holding experience constant.

Obviously, *Age* and *Assets* are strongly positively correlated over time for newly chartered banks. Hence, given the small number of observations for internet-only banks, it is statistically difficult to separate technology-based experience effects from technology-based scale effects in the same regression equation (ie a regression that restricts neither β_4 nor β_5 to be zero). See DeYoung (2001c) for a detailed discussion of this issue and for results of regression tests that include neither restriction.

The remainder of the right-hand variables are control variables. $State Job Growth_i$ is the percentage change in total employment in the home state of bank i over the sample period. (The nationwide average for this variable is assigned to internet-only banks). $MBHC_i$ is a dummy variable equal to 1 if bank i is an affiliate in a multi-bank holding company. $\%C\&I_{i,t}$ and $\%RealEstate_{i,t}$ are the percentages of bank i 's loan portfolio invested, respectively, in commercial and industrial loans and real estate loans at time t . $Thrift_i$ is a dummy variable equal to 1 if bank i holds a thrift charter, and OCC_i is a dummy variable equal to 1 if bank i holds a national bank charter. *Year Dummies* and *Quarter Dummies* are included to control for cyclical and seasonal influences on bank performance not captured by the other control variables. $e_{i,t}$ is a disturbance term distributed randomly with zero mean.

6. Results

The static analysis is largely consistent with results of earlier studies - on average, newly chartered internet-only banks perform poorly relative to newly chartered traditional banks. However, the dynamic analysis suggests that financial performance improves more quickly over time at the internet-only start-ups than at the traditional start-ups, and the evidence is consistent with both technology-based experience effects and technology-specific scale effects. Selected results from the regression tests are displayed in Table 1. For more complete results, see DeYoung (2001c). The regression results reflect the average financial performance of the internet-only banks and thrifts included in the data set, and are not meant to imply that any single one of these 10 institutions performed well or poorly during the sample period.

The key results from the static analysis are shown in the first column of figures. Profitability, as measured by ROA and ROE, is statistically and substantially lower at the typical one-year-old internet-only bank than at the typical one-year-old traditional bank - on average, internet-only ROA was lower by about 300 basis points, and internet-only ROE was lower by almost 1,100 basis points.

The regressions offer strong evidence that newly chartered internet-only banks tend to hold substantially higher levels of equity capital, tend to have greater difficulty generating deposit accounts, and tend to incur higher non-interest expenses relative to newly chartered traditional banks. On average, the equity/assets ratio was higher by 10% of assets at the internet-only banks. The deposits-to-assets ratio was lower by 7% of assets at the internet-only banks. The non-interest expense-to-assets ratio was 2% of assets higher at the internet-only banks, with the other non-interest expense ratio accounting for three quarters of the difference. There is weak statistical evidence that new internet-only banks grow faster, pay higher wages and have trouble generating loans and non-interest income compared with new traditional banks.

The second and third columns of figures display the key results from the dynamic analysis. These tests suggest that the financial performance gap between newly chartered internet-only banks and newly chartered traditional banks narrows - but does not necessarily close completely - as these banks pass through the first two years of their lives.

The performance time paths of new internet-only banks and new traditional banks diverge from each other for a handful of performance measures. This divergence is measured by the interaction coefficient β_4 . ROA at the typical one-year-old internet-only bank increased faster than at the typical one-year-old traditional bank, consistent with the hypothesis that technology experience effects are helping to close the performance gap between these two sets of banks. The driving force behind this improvement appears to be rapid declines in non-interest expenses, especially in the "other non-interest expenses" category. The total non-interest expenses/assets ratio and the other non-interest expenses/assets ratio both declined more sharply at the internet-only banks over time. Equity/assets ratios declined more slowly at internet-only banks than at traditional banks, reflecting second capital offerings at internet-only banks and explaining why the regressions find technology experience effects for ROA but not for ROE.

For the rest of the financial performance measures (ROE, interest margins, premises expenses, labour expenses, employment/assets, wages, loans to assets, deposits to assets, non-performing loans, non-interest income, physical overheads, asset growth, deposit interest rates and loan interest rates), the internet-only banks progressed at about the same rate over time as the traditional banks. The internet-only banks progressed more slowly than the traditional banks in only one aspect of financial performance, the deposits/assets ratio, suggesting that the internet distribution channel is more efficient at attracting loan customers than attracting core depositors.

The scale effects at the internet-only banks also diverge from scale effects at the traditional banks in a number of performance areas. This divergence is measured by the interaction coefficient β_5 . ROA increases more rapidly with bank size at the internet-only banks than at the traditional banks, and total non-interest expenses decline more rapidly with bank size at the internet-only banks than at the traditional banks. The decline in non-interest expenses largely reflects scale-related reductions in labour expenses and other non-interest expenses.

Table 1
Regression analysis

Dependent variable	Static analysis ¹	Dynamic analysis ²	
	β_3	β_4	β_5
Return on assets	-0.0310*** (0.0040)	0.0094* (0.0053)	0.0078** (0.0035)
Return on equity	-0.1096*** (0.0220)	-0.0123 (0.0291)	-0.0008 (0.0194)
Interest margin/assets	0.0002 (0.0018)	0.0004 (0.0023)	-0.0005 (0.0015)
Equity/assets	0.1034*** (0.0137)	0.0334* (0.0181)	0.0126 (0.0121)
Non-interest expenses/assets	0.0214*** (0.0066)	-0.0158* (0.0087)	-0.0148** (0.0058)
Premises expenses/assets	0.0015 (0.0011)	-0.0008 (0.0014)	-0.0013 (0.0009)
Labour expenses/assets	0.0045 (0.0035)	-0.0047 (0.0046)	-0.0084*** (0.0031)
Full-time employees/\$ million of assets	0.0478 (0.0507)	-0.0129 (0.0371)	-0.0550 (0.0447)
Wage (salary and benefits)/full-time employee	0.0083*** (0.0027)	0.0022 (0.0036)	-0.0014 (0.0024)
Other non-interest expense/assets	0.0154*** (0.0030)	-0.0104** (0.0040)	-0.0053** (0.0026)
Deposits/assets	-0.0700*** (0.0163)	-0.0417* (0.0215)	-0.0381*** (0.0143)
Loans/assets	-0.0636** (0.0253)	-0.0208 (0.0334)	-0.0331 (0.0222)
Non-performing loans/loans	0.0000 (0.0011)	0.0000 (0.0015)	-0.0006 (0.0009)
Non-interest income/assets	-0.0151*** (0.0036)	-0.0012 (0.0048)	-0.0022 (0.0032)
Physical overheads/assets	-0.0056 (0.0044)	0.0088 (0.0058)	0.0100** (0.0039)
Asset growth rate (annual)	0.7524** (0.3012)	0.0886 (0.4047)	..
Deposit interest rate	-0.0006 (0.0015)	0.0026 (0.0019)	0.0031** (0.0013)
Loan interest rate	-0.0082 (0.0054)	0.0068 (0.0072)	0.0031 (0.0048)

¹ Estimates of β_3 in regressions that restrict $\beta_4 = \beta_5 = 0$. ² Estimates of β_4 with β_5 restricted to 0 and of β_5 with β_4 restricted to 0 respectively.

**** and * indicate significance at the 1%, 5% and 10% level respectively.

Not all of the technology-specific scale effects are beneficial for new internet-only banks. Deposits/assets increase less rapidly with bank size, physical overhead to assets decline less rapidly with bank size, and deposit interest rates increase more rapidly with bank size at the internet-only banks. For the remainder of the financial performance measures, the effect of increased scale on internet-only bank performance was similar to the effect of increased scale on traditional bank performance.

7. Conclusion

Most banks that use the internet-only business model are struggling for profitability, and emerging conventional wisdom states that internet-only banking is a failed business model. But this may be premature. As internet-only banks age, they accumulate experience which may allow them to operate more efficiently in the future, and as they grow larger they may generate scale-based savings not available to traditional banks that use less capital-intensive production and distribution technologies. If the experience-based technology effects and/or the scale-based technology effects are large enough, the performance gap between internet-only banks and traditional banks could narrow in the future.

On the one hand, this study finds results that are largely consistent with the conventional wisdom. On average, internet-only banks have been substantially less profitable than traditional banks. They have generated lower business volumes than traditional bank start-ups, and any savings generated by lower physical overheads appear to be offset by other types of non-interest expenditure. But on the other hand, this study also finds that profitability ratios and non-interest expenses ratios improve more quickly over time at the internet-only start-ups than at the traditional start-ups, perhaps propelled by both technology experience effects and technology-specific scale effects.

If these trends continue into the future, the internet-only banking model could eventually prove to be a viable business model, despite its generally poor financial performance to date. However, the findings in this study are very preliminary. The data suggest that, after two full years of existence, the average newly chartered internet-only bank still lags the performance of the average newly chartered traditional bank. Furthermore, the data set used here contains just 10 banks over the first nine quarters of their life cycles, too little information over too short a period to draw definitive conclusions.

References

Berger, A N, R S Demsetz and P E Strahan (1999): "The consolidation of the financial services industry: causes, consequences, and implications for the future", *Journal of Banking and Finance*, vol 23, pp 135-94.

Berger, A N, W C Hunter and S G Timme (1993): "The efficiency of financial institutions: a review and preview of research past, present, and future", *Journal of Banking and Finance*, vol 17, pp 221-49.

DeYoung, R (1999): "The birth, growth, and life or death of newly chartered commercial banks", *Federal Reserve Bank of Chicago Economic Perspectives*, vol 23, no 3, pp 18-35.

——— (2001a): "The financial performance of pure play internet banks", *Federal Reserve Bank of Chicago Economic Perspectives*, vol 25, no 1, pp 60-75.

——— (2001b): "The role of the internet in the banking industry", *Chicago Fed Letter*, no 163, Federal Reserve Bank of Chicago, March.

——— (2001c): "Learning-by-doing, scale efficiencies and financial performance at internet-only banks", Federal Reserve Bank of Chicago working paper.

DeYoung, R and I Hasan (1998): "The performance of de novo commercial banks: a profit efficiency approach", *Journal of Banking and Finance*, vol 22, pp 565-587.

Evanoff, D D and P R Israilevich (1991): "Productive efficiency in banking", *Federal Reserve Bank of Chicago Economic Perspectives*, July, pp 11-32.

Furst, K, W W Lang and D E Nolle (2000): "Who offers internet banking?" *Office of the Comptroller of the Currency Quarterly Journal*, vol 19, no 2, June, pp 1-21.

Gemawat, P (1985): "Building strategy on the experience curve", *Harvard Business Review*, March-April, pp 143-9.

Sullivan, R J (2000): "How has the adoption of internet banking affected performance and risk at banks? A look at internet banking in the 10th Federal Reserve district", *Financial Industry Perspectives*, Federal Reserve Bank of Kansas City, December, pp 1-16.