How to value the deposit franchise

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Summary:

We provide a back-of-the-envelope valuation of the total deposit franchise of banks in the U.S. The deposit franchise is difficult to value because it is intangible. We find that the gain on the deposit franchise as of February 2023 is comparable to the unrealized losses on loans and securities from the recent rise in interest rates. The implied net loss to equity is thus relatively small. The losses become significantly larger if deposits reprice faster than they have until now, or if there is a run on the banking system. Regardless, the value of the deposit franchise is a key factor that must be considered when assessing the stability of the banking system.

Valuation framework:

In a previous note, we used a back-of-the-envelope calculation to estimate banks' unrealized losses on loans and securities at $1.75 trillion.[1] We provide a similar back-of-the-envelope calculation for the unrealized gain on the deposit franchise as of February 2023. We stress that this is a more difficult exercise because while loans and securities promise fixed cash flows, the cash flows on the deposit franchise depend on the behavior of depositors.

The value of the deposit franchise comes from the fact that banks pay below-market rates on deposits. When the Fed raises the Fed funds rate, deposit rates rise by only a fraction of the increase. This fraction is called the deposit beta. Let's assume for now that it is a known number. We will discuss uncertainty about beta further below.

Let's label the deposit beta β so that if the Fed funds rate is r^f, the deposit rate banks pay is βr^f. Historically β was around 0.3, that is banks tended to raise deposit rates by 0.3% for every 1% increase in the Fed funds rate. Through February 2023, deposit betas were lower than in previous rate cycles at about 0.2.[2] The main reason for this is the large increase in deposits relative to the demand for loans during the Covid pandemic.

As long as $\beta < 1$, the bank is paying a below-market rate and earning a "deposit spread" equal to the difference between the market rate and the deposit rate, $r^f - \beta r^f = (1-\beta)r^f$. If we take the most recent beta, $\beta = 0.2$, and the current interest rate, $r^f = 4.5\%$, the deposit rate is $\beta r^f = 1.35\%$ and the deposit spread is $(1-\beta)r^f = 3.15\%$. The deposit spread is the yearly income on the deposit franchise per dollar of deposits.

Banks also have operating costs related to maintaining their branches and offering services to their customers. Let's label these operating costs per dollar of deposits c. They are the expenses of the deposit franchise. Historically, they have been about 2% and remained stable.

[1] See https://pages.stern.nyu.edu/~pschnabl/research/DSS_SVB.pdf.

[2] See https://www.gobaker.com/wp-content/uploads/articles/TBG-B2111-Article_Series.pdf.

The net income from the deposit franchise per dollar of deposits is the difference between the deposit spread and the operating cost, $(1-\beta)r^f - c$. This net income rises when the Fed raises r^f and falls when the Fed cuts r^f. This is the source of the unrealized gain on the deposit franchise when the Fed raises interest rates.

The total value of the deposit franchise is the present discounted sum of the net income stream it provides. To calculate it, we need to make an assumption about how long the deposits will remain in the bank. Let's assume at first that they remain forever (i.e., any depositors that leave are replaced by new ones that come in). We relax this assumption later.

In this case the income stream $(1-\beta)r^f$ of the deposit franchise is the same as the income stream of a portfolio that invests $(1-\beta)$ dollars in a short-term government bond paying the going Fed funds rate, r^f, each period, and reinvesting the principal for the next period. This portfolio costs exactly $1-\beta$, hence this is the present value of the income stream of an infinitely-lived deposit franchise per dollar of deposits.

For example, if $\beta = 0.2$, then if you put $1-\beta = 0.80$ in a short-term bond paying $r^f = 4.5\%$, you will get $0.80 \times (1 + .045) = 0.836$ after a year. Take the 0.036 as income and re-invest the principal 0.80 for another year at the prevailing rate and so on. Every year you will get the deposit spread for that year and re-invest the principal, generating the income stream. This cost you $\$0.80$ to set up so that is its present value.

Since the bank also has to pay the operating costs forever, the expense side of the deposit franchise per dollar of deposits is the present value of a perpetuity that pays c. A perpetuity, also known as a consol bond, is a simple security with constant cashflows that last forever. The value of a perpetuity is c/r^p, where r^p is a long-term rate like the rate on long-term Treasury bonds.

Combining the income and expense side, the value of the deposit franchise per dollar of deposits under the assumption that β is known and the deposit is never pulled is $(1-\beta) - {c}/{r^p}$. The total value of the infinitely-lived deposit franchise is the value per dollar times the number of deposit dollars D:

$$DF^{\infty} = D \times \left(1 - \beta - {c}/{r^p}\right).$$

This is intuitive. The deposit franchise is more valuable when deposits are large (assuming it is not negative), when the deposit beta is small, when the operating cost is small, or when interest rates are high. In other words, the deposit franchise has negative duration.

Let us now relax the assumption that deposits stay in the bank forever. Runoff rates are difficult to estimate but a recent FDIC study finds that they are quite low (i.e., deposits are very "sticky").[3] Based on the FDIC study, a reasonable estimate is that they remain in the bank for $T = 10$ years on average. The value of the deposit franchise in this case is equal to the value calculated above minus the present discounted terminal value beyond T years:

$$DF = DF^{\infty} - \frac{DF^{\infty}}{(1+r^p)^T} = D \times \left(1 - \beta - {}^{c}/_{r^p}\right) \times \left[1 - \frac{1}{(1+r^p)^T}\right].$$

This is a slightly more complicated formula but the above intuition remains. The main difference is that the value of the deposit franchise shrinks as the runoff rate of deposits rises (T falls). This is expected because banks do not earn income from deposits that have left.

Baseline estimate:

We are now ready to plug in some numbers. Total U.S. deposits D stood at \$17.5 trillion at the end of 2022. As mentioned, the deposit β was 0.2 and the operating cost c is about 0.02. For the runoff we use $T = 10$ years. The long-term interest rate r^p was 4%. Given these assumptions, the aggregate value of the deposit franchise of all U.S. banks is

$$DF = 17.5 \times \left(1 - 0.2 - {}^{0.02}/_{0.04}\right) \times \left[1 - \frac{1}{(1+0.04)^{10}}\right] = \$1.7\ trillion.$$

To see if the change in the value of the deposit franchise can offset the unrealized losses on loans and securities, we need to calculate its value in early 2021 when the long-term rate was just 2.5%:

$$DF = 17.5 \times \left(1 - 0.2 - {}^{0.02}/_{0.025}\right)\left[1 - \frac{1}{(1+0.025)^{10}}\right] = \$0\ trillion.$$

Banks were thus not making any money on deposits given the low deposit spreads under the low rates, compared to their operating costs. So the change in the value of the deposit franchise is

$$\Delta DF = 1.7 - 0 = \$1.7\ trillion.$$

Thus, banks have an unrealized gain of \$1.7 trillion on their deposit franchise. This number is very similar to the unrealized losses of \$1.75 trillion, especially compared to the value of bank capital, which was \$2.2 trillion. The implied net loss to equity is thus rather small.

Discussion and risk factors:

Two key risk factors emerge from this calculation. The first is that the deposit beta is known and will remain 0.2 going forward. Given the recent turmoil, there is a risk that the deposit beta will rise. If it rises to 0.4, the net gain in the deposit franchise is only \$570 billion, which is

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[3] See http://fdic.gov/regulations/reform/coredeposit-study.pdf. The number we use, 10 years, is based on the last column of Table 5. Note that it is in the lower range of estimates.

significantly smaller than the unrealized loss. In this case the net loss to equity is $\$1.18$ trillion, about half the total amount.

The second key risk factor is the assumption that deposits will remain in place for 10 years. If depositors become less “sticky”, say to $T = 5$ years, the gain on the deposit franchise is $\$0.93$ trillion and the net loss to equity is $\$0.82$ trillion, which is about a third.

In an extreme scenario, if depositors run on the bank and the franchise is eliminated ($T = 0$), the net loss to equity is the full unrealized loss on loans and securities of $\$1.75$ trillion. This is large compared to the equity capital of $\$2.2$ trillion.

Finally, we note that this calculation is for the U.S. banking system as a whole. While this is important for regulators, it ignores large differences across banks stemming from outflows of deposits from one bank into another. In particular, regional banks may experience a reduction in the value of their deposit franchise at the expense of the largest banks.

What about Silicon Valley Bank? We have not done an analysis of SVB. It appears their unrealized losses were significantly larger than other banks due to the long duration of their loans and securities. In addition, SVB suffered a run, which eliminated its deposit franchise. They key risk factor for the run appears to have been the unusually high share of uninsured deposits.