Discussion: Government Guarantees and the Valuation of American Banks*

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Why are bank market-to-book ratios so low since the financial crisis? Are banks safer since tighter financial regulations have forced banks to increase their capital ratios and thus lowered the value of the implicit government guarantee?[1] The paper attempts to answer these questions using a decomposition of the market to book ratio of banks into

$$\frac{\text{Market Value of Equity}}{\text{Book Value of Equity}} = 1 + \text{Franchise Value} + \text{Gov. Guarantee},$$

where the franchise value is the difference between the fair- and book value of bank equity. The franchise value is positive when banks can increase the value of their assets above their costs, as captured by the book value, or when banks have a funding advantage. A clever application of a standard valuation technique in finance, the Gordon growth model, allows the authors to calculate the model implied market-to-book ratio and the franchise value of the aggregate U.S. banking sector. The inputs to the model are simply a discount rate, the cash flow to bank equity, and a cash flow growth rate. This method is accurate as long as its inputs accurately capture the cash flow process, the risk, and the opportunity cost of capital for bank equity investors.[2] With inputs from bank accounting data, annual reports, and corporate bond excess returns, the authors can compute two of the three terms in the above equation and conclude that the reduction in bank market valuation is primarily due to a reduction in the value of government guarantees.

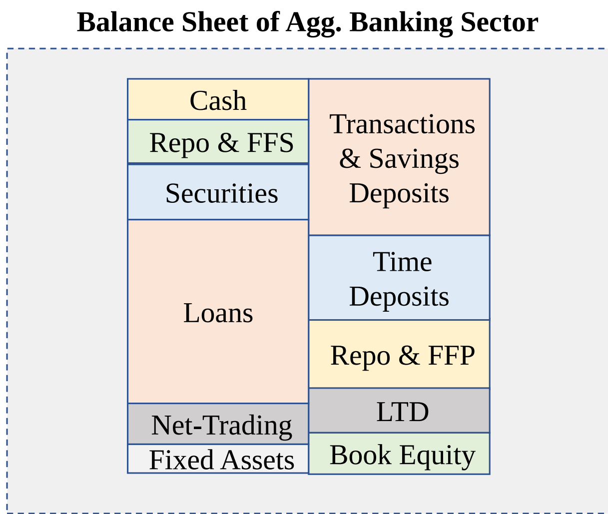
In my comments, I first present a simplified version of the valuation method to highlight the authors' key assumptions. Second, I present evidence that banks are exposed to interest rate risk, leading me to argue that interest rate risk should be taken into account for a more compelling analysis. Lastly, I offer a different perspective on the reduction in market valuations.

To apply the Gordon growth model to banks, one needs first to identify banks' cash flow sources. For this exercise, it is useful to inspect the aggregate U.S. bank balance sheet in Figure 1. Banks hold approximately 30% of their assets in securities, broadly defined as cash, repurchase agreements, federal funds sold, mortgage

[1]The evidence suggests that government guarantees are particularly important for large banks (Gandhi and Lustig (2015)), as well as the aggregate banking sector (Kelly, Lustig, and Van Nieuwerburgh (2016)).

[2]Different states, such as default and non-default, can be captured by computing the expected value of the discounted cash flows for each state.

Figure 1: Aggregate Balance Sheet of U.S. Bank Holding Companies



Note: This graphic approximates the relative share of assets and liabilities of the U.S. aggregate banking sector from 2000-2010. Repo denotes repurchase agreements. FFS stands for federal funds sold. FFP are federal funds purchased. LTD means long term debt. Net-Trading is the difference between trading assets and trading liabilities.

backed securities and U.S. treasuries. Loans make up 55% of assets. More than 10% of assets are trading assets, such as interest rate derivatives. The remainder are fixed and intangible assets. Banks fund these assets with deposits and debt raised from the capital market. Thus, overall the balance sheet looks like a fixed-income portfolio.

Each balance sheet position derives its value from the cash flow it generates. Hence, the fair value at time zero of a balance sheet position i is

$$FV_0^i = \mathrm{E}_t \sum_{t=1}^{\infty} \frac{\mathrm{CF}_t^i}{1 + r_t^i}, \tag{1}$$

where CF_t^i denotes the cash flow from position i at time t and r_t^i denotes the opportunity cost of capital for an investment with the same project length and risk as position i. To bring this discounted cash flow model to the data, we need accurate cash flow projections and the appropriate discount rate r_t^i for each balance sheet (and off-balance sheet) position. Note that the Gordon growth model used by the authors is a special case of equation (1) when CF_t^i is growing at a constant rate g, and the opportunity cost of capital r_t^i is constant over time. Equation (1) requires us to be thoughtful about the opportunity cost of each position. Banks' franchise value can only be positive if on net banks' positions have a higher return than their opportunity cost of capital. The authors side-step this difficulty in their franchise value calculation by simply relying on fair value estimates on select balance sheet positions provided by banks and regulators. These positions are loans and deposits. The implicit assumption is that banks (regulators) have accurately estimated the cash flow process of loans (deposits) and the opportunity cost of capital. Moreover, the authors assume that any positive franchise value can only come from loans or deposits, implying that all non-loan assets have a fair-to-book value ratio of one.[3] This means that banks have either a funding advantage, i.e., can issue deposits at below competitive rates, or earn more on loans than what it costs them to make loans. Yet the authors also assume that loans and deposits are issued competitively, which further obfuscates the origin of the franchise value for loans and deposits in the model. Without a clear articulation of how banks generate value with their balance sheet, it is a bit difficult to see how outside estimates from banks and regulators map into the authors' valuation model. Moreover, they rely heavily on the accuracy of these estimates, in particular regarding the risk and investors' opportunity cost calculation.

The value of the government guarantee is simply the difference between the model implied market value of equity as described in section 6.2. of the paper and the model implied franchise value. The model implied market value of bank equity is also based on a Gordon growth model, with the key step being the valuation of cash flows in two states: non-default and default. The authors assume that only credit risk matters for the default decisions of banks.

Interest Rate Risk. Given the fixed income nature of bank balance sheet positions, the absence of interest rate risk in the valuation model of the paper is notable. Banks' balance sheet and off-balance sheet positions embed significant interest rate risk exposure that get expressed in bank equity valuations (e.g.,English, Van den Heuvel, and Zakrajšek (2018)) and actual bank default rates.

[3] In fact, banks' accounting rules require trading assets and most securities to be recorded at fair value, suggesting one avenue for a potential mismeasurement of banks' franchise value.

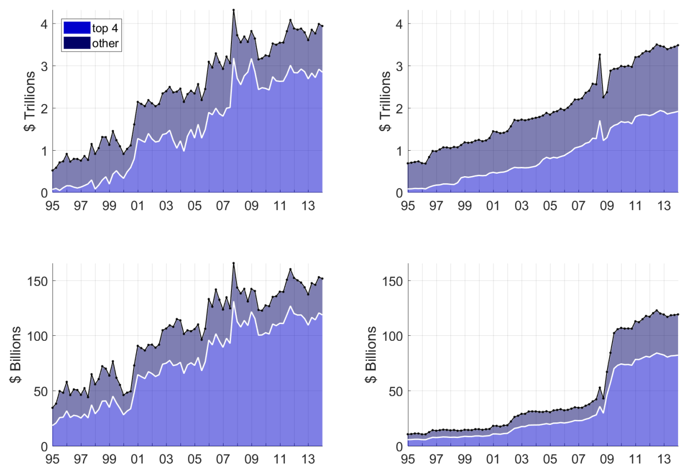
In Begenau, Piazzesi, and Schneider (2015), we propose a method to estimate and measure this exposure in two steps. The first step is to decompose all book value positions of banks into their expected cash flows and compute the fair value of each position by applying equation (1). Riskier cash flows are discounted at the discount rate that reflect their underlying interest rate and credit risk.[4] For our second step, we use a replication argument that says that any fixed income position can be replicated with a small number of bonds. This final step allows us to represent each balance sheet as an interest rate- and credit risk factor portfolio. This factor portfolio mimics banks' exposures and allows me to also comment on the question whether banks have gotten safer since the crisis.

To illustrate the first step of our method, take the loan portfolio of a bank. Its loan book is predominately reported at book value. Book values only coincide with fair values in the unlikely case that (1) the yield curve has not moved since the loan was originated and (2) the loan contains no credit risk. From the data, we observe the maturity and credit risk distribution, as well as the total dollar value of the position. Then, for each position of credit rating j and remaining maturity m, we calculate the implied coupon payments until the loan matures using the standard annuity formula. Since each coupon payment can be viewed as the face value of a zero coupon bond, a loan book can be recast as a portfolio of zero coupon bonds. The fair value of a zero coupon bond equals just its appropriately discounted face value, where the discount rate reflects the duration and the risk of the bond.

Trading assets pose another challenge for our method. Trading assets are mainly derivatives of which interest rate swaps are the largest component. Even though banks report those positions at fair value, they do not report the trading direction of their derivatives. This means that we would not know whether a bank stands to win or to loose when interest rates rise. To fill this gap in the data, we estimate the trading direction of banks' interest rate derivative positions from profit and losses, notionals, and the history of interest rates. This allows us to conveniently represent the swap positions as a portfolio of bonds.

[4]Begenau, Bigio, and Majerovitz (2018) show the problem with relying on the accounting measures provided by banks. Banks' book equity includes banks' own fair value estimates for most securities and trading assets but yet does not capture losses as well as market values do. Thus, caution should be exercised when taking fair value estimates from banks at face value as the authors do in order to calculate the franchise value.

Figure 2: Total Factor Exposures

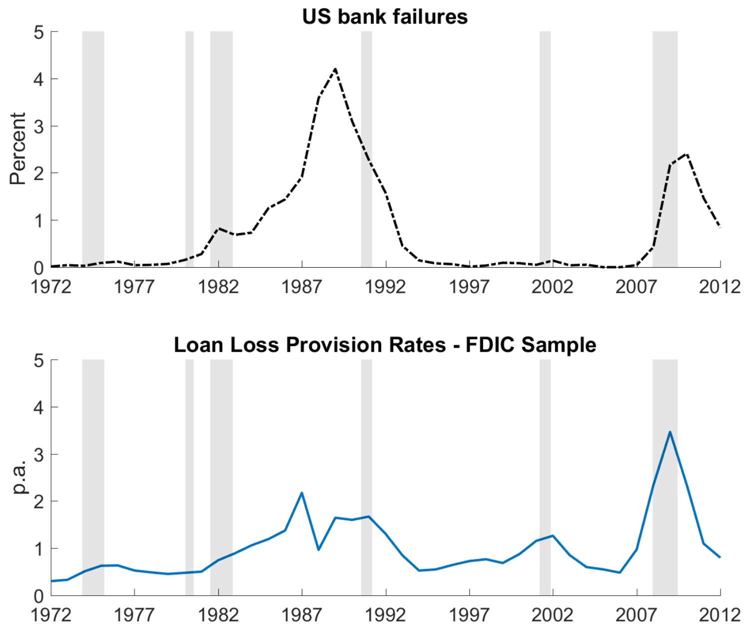


Source: This figure is from Begenau, Piazzesi, and Schneider (2015)
Note: Top row: exposures to interest rate risk (left panel) and credit risk (right panel). Black lines are total factor exposures of U.S. banking sector; shading indicates contribution of top 4 bank holding companies (light) and all other banks (dark). Bottom row: gains or losses from one standard deviation realization of interest rate factor (left panel) and credit risk factor (right panel). Black lines are total gains / losses of US banking sector; shading indicates share of top 4 (light) and all others (dark).

The end result of our estimation is a factor portfolio that has exposures to an interest rate factor as well as a credit risk factor, and is short in cash (see Figure 2). This portfolio intuitively resembles the maturity transformation and credit provision business of banks. Banks take on credit and interest rate risk when they make loans that are funded with shorter term deposits or capital market debt.

Figure 2 shows the resulting interest rate and credit risk exposures of the aggregate banking sector. There are three notable points to make. First, for most of the sample, the interest rate risk exposure of banks (top-left) dominates the credit risk exposure (top-right). Second, the typical gains and losses due to interest rate risk (bottom-left) exceed that of credit risk (bottom-right). Third, consistent with the authors' conclusion that post crisis-regulations have not succeeded in reducing credit-risk in banks' portfolios, the figure shows a doubling of the typical gains and losses on banks' credit exposure since the crisis. The reason is a rise in the conditional volatility of the credit factor post crisis, leading to higher expected gains

Figure 3: Bank Default Rates and Credit Risk



Note: The data is from the FDIC.
`https://www5.fdic.gov/hsob/SelectRpt.asp?EntryTyp=10&Header=1`.
The grey bars denote NBER recessions.

and losses. Overall though, interest rate risk still dominates.

For evidence on how interest rate risk matters for the default risk of banks, I plot the default rate of banks in Figure 3 since the early 1970s together with the loan loss provision rate, which measures loan losses in a more timely manner. The top panel of Figure 3 shows that bank default rates were much higher and persistently so during the Savings and loan (S&L) crisis of the 1980s. The root causes for the S&L crisis (e.g., Hubbard (1991), White (1991), National Commission report 1993) were high interest rates. These hurt banks in three ways. First, faced with uncompetitively low deposit rates depositors withdrew their funds to invest them in higher yielding securities. Second, banks predominately held long-term and fixed-rate loans that were funded with short-term liabilities. The rise in funding rates meant banks incurred large losses. Third, high interest rates lowered the market value of assets and thus impaired banks' net-worth. Attempts to salvage an impaired net worth position often involved investing in higher yielding and therefore riskier assets, leading to credit losses later in the decade (see bottom panel of Figure 3).

Taken together, this evidence suggests that interest rate risk should factor in both the risk-neutral probability calculation as it may cause banks to default as well as in the measurement of the franchise value.

Why are banks' market valuations low? Another interpretation of why bank valuation decreased over time comes from Begenau and Stafford (2018). In this paper, we directly measure the franchise value of banks from the perspective of shareholders by comparing banks against their closest capital market alternative. If banks are indeed the most efficient providers of products such as loans and deposits we expect their competitive edge and therefore their franchise value to be large. The evidence that we bring to bear, however, challenge that very idea. Bank assets underperform a simple maturity-matched US treasury (UST) portfolio and bank deposits are costlier than banks' non-deposit funding sources thanks to an expensive branch network.

As argued above, a significant source of risk for the aggregate banking sector comes from interest rates, consistent with the maturity transformation role of banks. In line with Begenau, Piazzesi, and Schneider (2015) and Atkeson, d'Avernas, Eisfeldt, and Weill (2018) we assume that the portfolio of banks can be replicated with a bond portfolio. Similar exposures should be priced similarly.[5] Focusing on interest rate risk first, this implies that any asset should earn at least as much as required by its duration.

Table 1 presents the result for aggregate U.S. bank assets.[6] To pick the appropriate maturity match for the UST portfolio, we take the average maturity of bank assets of 3 years from the data.[7] Using a long dated sample of FDIC insured commercial banks, we compute the *unlevered* return on bank assets (ROA) as

[5] We rely on this fundamental insight (see e.g., Merton (1995) and Merton and Bodie (1995)) when we compare the return of banks against the return of a maturity matched UST portfolio.

[6] This table is an excerpt from Table 2 in Begenau and Stafford (2018).

[7] The data comes from the quarterly regulatory fillings of commercial banks. This calculation uses the remaining maturity for fixed-rate securities and the next repricing date for floating-rate securities.

Table 1: Unlevered Return on Bank Assets compared to 3 yr US Treasury

annual %	Return on Assets			3yr UST	
	$s = 30\%$	$s = 50\%$	$s = 70\%$	MV	BV
Full Sample 1960-2015					
Mean	4.49	4.06	3.64	5.88	5.74
Std	1.73	1.69	1.65	4.41	2.60
Tstat ttest $\mu^{Rep} - \mu^{B} = 0$				3.47	5.49
Correlations					
UST 3yr MV	0.70	0.71	0.72		
UST 3yr BV	0.90	0.92	0.93		
1960-1980					
Mean	4.18	3.83	3.48	5.24	5.57
Std	1.82	1.78	1.73	3.00	2.36

Note: The data is from the FDIC.
`https://www5.fdic.gov/hsob/SelectRpt.asp?EntryTyp=10&Header=1`.
MV means market value. BV means book value. We calculate the book value of the 3 year US Treasury portfolio as BV(t+1) = BV(t) + interest income – purchases + proceeds. A share $1 - s$ of the operating expense is attributed to assets.

$$\mathrm{ROA}_t = \frac{\text{Net Income}_t - (1-\tau)(\text{Deposit Income} - \text{Interest}_t - (1-s)\text{OpEx}_t)}{\text{Assets}_{t-1}},$$

where τ denotes the tax rate and s the share of operating expenses that are attributed to assets as opposed to deposits.[8] The net income variable is the correct numerator for the return on equity but not for the return on assets. To calculate the return on assets, we need to add back all interest expenses, deduct any deposit service fees from non-interest income, and add back the deposit share of operating expenses. In order to compare banks' smoothed book returns with capital market returns we apply the same accounting method to the latter. Using the book value measure of the 3 yr UST portfolio significantly increases its correlation with bank ROA (see Table 1).

The results (tabulated in Table 1) suggest that bank assets underperform a matu-

[8] Bank branches are a key driver of banks' operating expenses. Banks rely on bank branches to sustain their deposit franchise and to make loans.

rity matched portfolio by 1.68% per year on average. In short, bank assets do not earn the required return implied by their embedded interest rate exposure. The difference is large and not merely an artifact of our operating expense assumption. With roughly 3% of assets and 40% of equity, banks' operating expenses exceed even the cost of expensive investment vehicles such as hedge funds that have costs amounting to 4-6% of invested capital.

Recent academic papers assert that deposits are an important source of bank value (e.g., Egan, Lewellen, and Sunderam (2017), Drechsler, Savov, and Schnabl (2018)). One often cited reason is that deposits look cheaper[9] compared to non-deposit funding options as deposit rates are typically below other funding rates.[10] However, they are also associated with a costly branch-network as Figure 4 shows. Operating expenses increase exponentially in the number of branches and so do deposits. Based on cross-sectional regressions of log expenses on log deposits and log loans, a one-percentage change in deposits is associated with a 0.47 percentage change in log expenses. Taking into account the operating expenses on deposits increases the average annual deposit cost rate from 2.91% to 4.89% over the period from 1960 to 2015, while non-deposit debt costs banks only 4.29%.[11] The scope for a funding advantage of banks are therefore small.

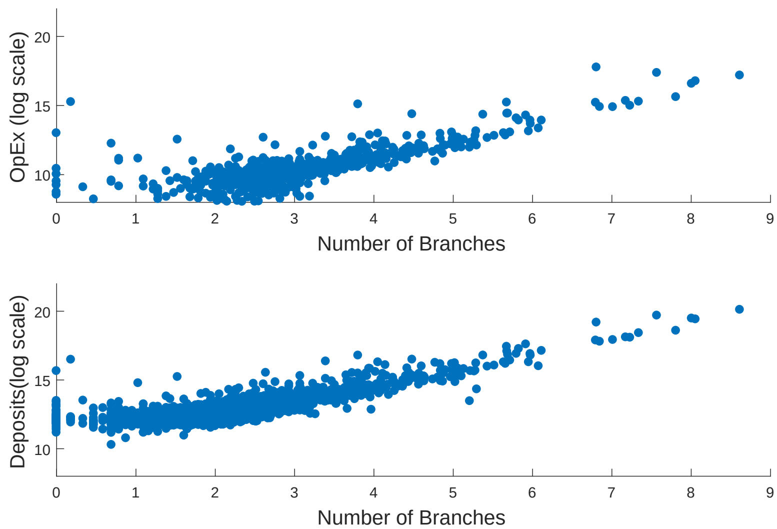
What can be taken away from this evidence? A positive franchise value means a firm has created value beyond the value of its inputs. It is a time-varying notion that depends on market conditions affecting the opportunity cost of capital. Valuation models take this into account by choosing a discount rate that represents the best alternative for the capital provider. By relying on banks' (regulators') static estimates of loan (deposit) fair values the authors lean heavily on banks' (regulators') proper application of equation (1) instead of taking their valuation model more seriously and apply it directly to the data as in Begenau, Piazzesi, and Schneider

[9]Since the financial crisis and the ensuing low interest rate policy, even the funding advantage based on interest rates alone has dissipated.

[10]Drechsler, Savov, and Schnabl (2018) suggest that deposits are valuable because they insulate banks against interest rate risk. The evidence in English, Van den Heuvel, and Zakrajšek (2018) are inconsistent with this interpretation as the stock return of banks most reliant on core deposit funding react more negatively to interest rate shocks. While net interest margins of these core-deposit heavy banks remain constant, they loose deposits at higher rates, forcing them to either replace deposits with non-deposit funds or to shrink assets. The study shows that banks do both.

[11]This calculation assumes an asset expense share of 50%. When 30% (70%) of expenses are allocated to assets, deposits costs 5.59% (4.10%).

Figure 4: Branches & Expenses



(2015) and Begenau and Stafford (2018). While the authors find a positive franchise value based on bank supplied fair value estimates, the results in Begenau and Stafford (2018) suggest that banks have a negative franchise value. This discussion also affects the calculation of the model implied market value of bank equity, as both the opportunity costs of capital and the default state calculation are sensitive to it. Certainly, it is plausible that higher capital cushions have reduced the value of government guarantees. But how much of the reduction in banks' market valuation is due to government guarantees, franchise value, or some unmodeled factor still remains to be ascertained.

Conclusion. Atkenson, d'Avernas, Eisfeldt, and Weill present a useful and clever way to decompose aggregate bank valuation ratios into a government guarantee part and a franchise value part. The accounting model is very transparent and insightful to think through as it requires an examination of the assumed sources of bank value. Using this decomposition, they claim that (1) bank valuations decreased since the crisis because of a sharp reduction in the value of government guarantees, and (2) despite that banks have not become safer.

This discussion provides evidence that is consistent with the second conclusion, namely that banks have not decreased their overall risk exposure since the crisis. In fact, the evidence I bring to bear shows that banks' credit risk exposure has since doubled. I have also presented evidence that calls for a more skeptical stance towards the paper's first conclusion. The business model of banking is at its core an interest rate spread and volume business, both of which are sensitive to market interest rates. Without taking into account interest rate risk and investors' opportunity costs, the proposed valuation model is going to mismeasure the market- and franchise value of banks. Notwithstanding some important details of the accounting exercise, Atkenson, d'Avernas, Eisfeldt, and Weill shine a light on how to make productive use of banks' market and accounting data to speak to a first order question.

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