Session 27 - Credit Risk and Fair Value

Blankespoor et al. (2013) and Cantrell et al. (2013)

April 10, 2019

Overview of Concepts and Critiques

Summary - Blankespoor, Linsmeier, Petroni, and Shakespeare (2013)

- Traditional Measures of Bank credit risk under GAAP employ historical costs and a mixed-attribute model
  - Some supporters of these measures, including the American Bankers Association believe fair values can be transitory due to changes in credit risk, liquidity, and interest rates. However, use debt until full maturity, so these costs will not be essential and potentially misleading
- At the time of this article, FASB looked into proposals to employ greater use of fair value
- These authors compare the ability of leverage measured under different methods of accounting to reflect credit risk in the banking industry using bond yield spread and bank failure as a measure of credit risk regressed on fair value, fair value and historical (amortized) costs, and fewer fair value and more historical costs (Tier 1) regulatory captial.
- Authors find relationship between credit risk and leverage get stronger as the amount of financial instruments measured at fair value increases

Difference of Fair Values and Net Historical Costs - CMY

(1) Fair values consider all expected credit losses, whereas loan loss reserves tend to foucs only on incurred credit losses
   - Expected Cash flow for two measures differ

(2) Loan fair values change and can shift away from historical costs when discount rate or market risk premium tied to credit quality of banks changes

(3) Loan fair values can change when market-wide interest rates unrelted to credit quality change (such as changes in term structure)

Cons of Fair Value according to BLPS

Arguments against fair value:

(1) Fair Value accounting for assets that are instrument held for collection does not faithfully represent a bank's financial condition.

(2) Fair value accounting for liabilites that are instruments held for payment is not appropriate because
   (i) Few opportunities for firms to settle liabilities before maturity at other than the pricnipal amount (illiquidity)
   (ii) Counterintuitive that under fair value accounting for fixed-rate debt, an increase in credit risk results in a write-down of the value of the debt and a gain in net income

(3) Financing of a bank's operations links loans issued with the deposits received, and one can best capture economics of the banking model if loans and deposits are similarly measured.

(4) When fair values must be estimated, the valuation process can be significantly complex, and the resulting numbers sufficiently unreliable to cause benefits not to outweigh the costs

(5) Fair value accounting contributes to procyclicality of financial system, which is a cause of the Great Recession - therefore it is harmful

BLPS motivation

- Fair value research appears good in equity markets, but no one has looked at credit risk, and the two asset classes are sufficiently different such that it requires careful evaluation.

CMY Pros

- Fair values are based in theory upon market prices or other market inputs, and market participans will pay more for cash flows with a lower credit risk.

CMY Cons

(1) Active markets for most bank loans do no exist
   - Subjective and not reliable

(2) loan fair values are not a relevant measure attribute because the vast majority of loans are held for collection and are not sold, even if borrowers experience financial difficulty

(3) Fair values are disclosed only in notes and not financial statements

Question: Give the apparent trouble of calculating fair value, how do they do it for their research?

BLPS Empirical Design

Defintion: Measure leverage with the *Tangible Common Equity* or TCE approach to leverage which is defined as (assets - intangible assets + mortgage servicing rights) / (assets - intangible assets + mortgage servicing rights - liabilities - preferred stock)

Leverage: Use three different measures: Fair Value, GAAP, and *TIER1* (inverse of Tier 1 leverage ratio)

Notice the three measures of leverage they test - examines well the gradual decrease in using fair value

FIGURE 2
Measurement Attributes for Leverage Measures

	FV	GAAP	TIER1
Financial Assets			
Cash	FV	FV	FV
Trading Securities	FV	FV	FV
Available-for-Sale Securities	FV	FV	Cost[b]
Held-to-Maturity Securities	FV	Cost	Cost
Loans	FV	Cost	Cost
Derivatives	FV	Cost[a]	Cost[c]
Financial Liabilities			
Deposits	FV	Cost	Cost
Short-Term Borrowings	FV	Cost	Cost[d]
Long-Term Debt	FV	Cost	Cost[d]

Credit Risk: is measured by Bond Yield Spreads (yield at the time the bond is issued or traded less Treasure rate for bond of similar maturity) and bank failure

Asset Quality Measures

NonAccrLoans = the ratio of loans in non-accrual status to total assets as of the most recent fiscal year-end;

PastDueLoans = the ratio of loans that are past due 90 days or greater to total assets as of the most recent fiscal year-end; and

OREO = the ratio of other real estate owned to total assets as of the most recent fiscal year-end.

All three measures are designed to capture credit-related issues that the firm is currently facing or might face in the future as a result of loans made. High non-accrual and past due loan balances imply greater uncertainty about future bank performance and more risk of default. Similarly, because banks typically receive OREO as payment when a loan does not repay, higher OREO also signals poor loan performance and potentially higher credit risk.

Interest Rate Risk Measure

AbsMaturityGap = the absolute difference between assets and liabilities that are due to mature or be repriced within one year, divided by total assets as of the most recent fiscal year-end. The higher a bank's maturity gap between assets and liabilities, the more potential that shocks to the bank's balance sheet will cause further mismatching of assets and liabilities and increase the credit risk of the bank.

Profitability Measure

ROA = net income divided by total assets as of the most recent fiscal year-end. The effect of *ROA* on credit risk is not straightforward. If higher profitability is a signal of more efficient operations, then we would expect a negative relation with credit risk. Alternately, higher profitability obtained by higher risk-taking would result in higher credit risk for those banks.

/

Basic Regression: regress yield spread on three leverage measures as of most recent fiscal end, plus variables above.

In subsequent regressions, they also consider the following dependent variables to gain further insight into the relation between fair values and bond yields. These categories "drive the dominance of FV":

(1) FVLoans - leverage based on GAAP amounts except for loans, which are measure at fair value
(2) FVSec - same as above, except using securities
(3) FVOA - other assets
(4) FVDep - deposits
(5) FVOL - other liabilities

Bank Failure:

In addition to making plots, they use univariate (with different leverage measures) and multivariate logit regressions [1] (with *NonAccrLoans, PastDueLoans, OREO, AbsMaturityGap, ROA, LnAssets*). They look at 1, 2, and 3 years prior to failure.

[1] By multivariate I believe they mean multivariable in terms of independent variables

FYI

The logit is a link function / a transformation of a parameter. It is the logarithm of the odds. If we call the parameter π, it is defined as follows:

$$\text{logit}(\pi) = \log\left(\frac{\pi}{1-\pi}\right)$$

The logistic function is the inverse of the logit. If we have a value, x, the logistic is:

$$\text{logistic}(x) = \frac{e^x}{1+e^x}$$

Thus (using matrix notation where $\boldsymbol{X}$ is an $N \times p$ matrix and $\boldsymbol{\beta}$ is a $p \times 1$ vector), logit regression is:

$$\log\left(\frac{\pi}{1-\pi}\right) = \boldsymbol{X\beta}$$

and logistic regression is:

$$\pi = \frac{e^{\boldsymbol{X\beta}}}{1+e^{\boldsymbol{X\beta}}}$$

/

CMY Empirical Design

Independent Variables

(1) Net Historical costs of loans ($LOANHC$)
(2) Fair Value of Loans ($LOANFV$)
(3) Difference between reported loan fair values and net historical costs ($FVDIFF$)

Proxies for Credit Loss

(1) Net Chargeoffs (CO) represents amount of loans written off as uncollectible in a year, net of any recoveries. Represents recognition in the bank's financial statements that loan payments will not be collected
(2) Non-performing Loans (NPL) - loans that have been modified in a troubled debt restructuring, past due, or for which interest revenue is not currently being recorded.

$$CO_{t+1} = \alpha + \beta_1 CO_t + \beta_2 NPL_t + \beta_3 LOANHC_t + \varepsilon_t; \quad (1$$

$$CO_{t+1} = \alpha + \beta_1 CO_t + \beta_2 NPL_t + \beta_3 LOANFV_t + \varepsilon_t; \quad (2$$

$$NPL_{t+1} = \alpha + \beta_1 NPL_t + \beta_2 LOANHC_t + \varepsilon_t; \quad (3$$

$$NPL_{t+1} = \alpha + \beta_1 NPL_t + \beta_2 LOANFV_t + \varepsilon_t. \quad (4$$

/

$$CO_{t+1} = \alpha + \beta_1 CO_t + \beta_2 NPL_t + \beta_3 LOANHC_t + \beta_4 FVDIFF_t + \varepsilon_t; \quad (5)$$

$$NPL_{t+1} = \alpha + \beta_1 NPL_t + \beta_2 LOANHC_t + \beta_3 FVDIFF_t + \varepsilon_t. \quad (6)$$

Prediction Tests: Logistic Regression

$$\begin{aligned}\Pr(FAILn, \text{ where } n = 1,2,3)_t = \alpha &+ \beta_1 EQUITYCAP_t + \beta_2 LOAN\%_t + \beta_3 NPL_t \\ &+ \beta_4 LIQUIDITY_t + \beta_5 ROA_t + \beta_6 SIZE_t + \beta_7 HOLDINGCO_t \\ &+ \beta_8 DEPOSIT_t + \beta_9 LOANHC_t + \beta_{10} FVDIFF_t + \varepsilon_t.\end{aligned} \quad (7)$$

Out of Sample: Use actual out of sample prediction to evaluate ability of fair value vs historical value (NICE!)

BLPS Table 2

Panel C: Regression of Yield Spread on Leverage Measures, Bank Risk Measures, and Issue Characteristics, 1998–2010 (46 Banks, 1861 Bonds)

	FV	*GAAP*	*TIER1*
Leverage	18.26***	16.60*	−16.83*
	(11.21)	(1.83)	(−1.76)
NonAccrLoans	−1.135	−32.38	−207.2
	(−0.03)	(−0.60)	(−1.42)
PastDueLoans	−66.68	98.48	103.7
	(−1.35)	(0.77)	(0.66)
OREO	348.5*	467.2	418.7
	(1.81)	(1.23)	(1.19)
AbsMaturityGap	−510.3**	−468.1***	−697.0**
	(−2.20)	(−2.78)	(−2.32)
ROA	−61.53*	−97.31*	−294.9***
	(−1.73)	(−1.71)	(−3.26)
Ln_offer_amt	−47.79*	−48.55**	−47.89*
	(−2.00)	(−2.04)	(−1.95)
Shelf	−3.824	6.916	10.66
	(−0.21)	(0.34)	(0.51)
Call	−108.1	−61.01	−10.82
	(−1.14)	(−0.63)	(−0.09)
Put	60.76	46.30	16.29
	(1.14)	(0.82)	(0.28)
Redeem	13.59	−42.55	−92.70*
	(0.34)	(−1.36)	(−1.77)
YrsToMaturity	−1.183***	−1.217***	−1.289***
	(−3.34)	(−2.78)	(−2.70)
LnAssets	36.65	−82.25	−11.08
	(0.41)	(−0.46)	(−0.08)
n	80,393	80,393	80,393

	FV	*GAAP*	*TIER1*
Adj R^2	0.4460	0.3676	0.3380
Rank	1	2	3

Panel D: p-values from Vuong Tests of Differences in Explanatory Power for Panel C Regressions

	GAAP	*TIER1*
FV	0.000	0.000
GAAP		0.000

CMY Table 3 and 4

TABLE 3

Ability of Loans at Historical Cost and Fair Value to Predict Future Chargeoffs and Non-Performing Loans In Sample

Panel A: Ability of Loans at Historical Cost and Fair Value to Explain Net Chargeoffs

$$CO_{t+1} = \alpha + \beta_1 CO_t + \beta_2 NPL_t + \beta_3 LOANHC_t + \varepsilon_t. \quad (1)$$
$$CO_{t+1} = \alpha + \beta_1 CO_t + \beta_2 NPL_t + \beta_3 LOANFV_t + \varepsilon_t. \quad (2)$$

	Model (1)		Model (2)		Model (1a)		Model (2a)	
	Coeff.	**t-stat**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**
α_0 Intercept	0.517	10.83***	0.022	3.01***	1.142	22.44***	0.064	5.00***
β_1 CO_t	0.529	8.21***	0.690	10.74***				
β_2 NPL_t	0.233	12.21***	0.287	14.29***				
β_3 $LOANHC_t/LOANFV_t$	(0.522)	−10.82***	(0.021)	−2.89***	(1.150)	−22.36***	(0.058)	−4.55***
	Adj. R^2	0.5279	Adj. R^2	0.4845	Adj. R^2	0.3266	Adj. R^2	0.0131
	Z-stat	6.34***			Z-stat	13.53***		

Panel B: Ability of Loans at Historical Cost and Fair Value to Explain Non-Performing Loans

$$NPL_{t+1} = \alpha + \beta_1 NPL_t + \beta_2 LOANHC_t + \varepsilon_t. \quad (3)$$
$$NPL_{t+1} = \alpha + \beta_1 NPL_t + \beta_2 LOANFV_t + \varepsilon_t. \quad (4)$$

	Model (3)		Model (4)		Model (3a)		Model (4a)	
	Coeff.	**t-stat**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**
α_0 Intercept	0.517	5.61***	(0.023)	−1.34	2.285	15.86***	0.050	1.77*
β_1 NPL_t	1.183	30.16***	1.270	35.88***				
β_2 $LOANHC_t/LOANFV_t$	(0.516)	−5.54***	0.030	1.75*	(2.292)	−15.74***	(0.030)	−1.03
	Adj. R^2	0.5172	Adj. R^2	0.5107	Adj. R^2	0.1832	Adj. R^2	0.0002
	Z-stat	2.23**			Z-stat	9.76***		

TABLE 4

Ability of Loans at Historical Cost and Fair Value to Predict Future Chargeoffs and Non-Performing Loans Out of Sample

Panel A: Ability of Loans at Historical Cost and Fair Value to Predict Net Chargeoffs Out of Sample

$$CO_{t+1} = \alpha + \beta_1 CO_t \beta_2 NPL_t + \beta_3 LOANHC_t + \varepsilon_t. \quad (1)$$
$$CO_{t+1} = \alpha + \beta_1 CO_t + \beta_2 NPL_t + \beta_3 LOANFV_t + \varepsilon_t. \quad (2)$$

	Model (1)	Model (2)	Model (1a)	Model (2a)
Mean FE	0.0028	0.0029	0.0035	0.0039
t-statistic (diff.)	−7.86***		−17.83***	

Panel B: Ability of Loans at Historical Cost and Fair Value to Predict Non-Performing Loans Out of Sample

$$NPL_{t+1} = \alpha + \beta_1 NPL_t + \beta_2 LOANHC_t + \varepsilon_t. \quad (3)$$
$$NPL_{t+1} = \alpha + \beta_1 NPL_t + \beta_2 LOANFV_t + \varepsilon_t. \quad (4)$$

	Model (3)	Model (4)	Model (3a)	Model (4a)

BLPS Table 7

TABLE 7

Results of Regressing Bank Failure on Leverage Measures

Panel A: Logit Regression of Bank Failure on Leverage Measures—1 Year Prior to Failure

1 Year Prior to Failure	*FV*	*GAAP*	*TIER1*
Leverage	0.260***	0.242***	0.477***
	(10.85)	(8.55)	(6.84)
n	7,028	7,028	7,028
Pseudo R^2	0.2248	0.1860	0.1571
Rank	1	1	2

Panel B: Logit Regression of Bank Failure on Leverage Measures—2 Years Prior to Failure

2 Years Prior to Failure	*FV*	*GAAP*	*TIER1*
Leverage	0.151***	0.0993***	0.0598
	(7.05)	(3.69)	(0.85)
n	7,007	7,007	7,007
Pseudo R^2	0.0532	0.0213	0.0017
Rank	1	2	3

Panel C: Logit Regression of Bank Failure on Leverage Measures—3 Years Prior to Failure

3 Years Prior to Failure	*FV*	*GAAP*	*TIER1*
Leverage	0.0823***	0.0481	−0.168**
	(2.88)	(1.47)	(−2.51)
n	6,966	6,966	6,966
Pseudo R^2	0.0104	0.0040	0.0111
Rank	1	2	1

CMY Table 6

TABLE 6

Bank Failures

Panel A: Ability of Loans at Historical Cost and Fair Value Difference to Predict Bank Failures

$$\Pr(FAIL2 = 1)_{t+1} = \alpha + \beta_1 EQUITYCAP_t + \beta_2 LOAN\%_t + \beta_3 NPL_t + \beta_4 LIQUIDITY_t + \beta_5 ROA_t + \beta_6 SIZE_t + \beta_7 HOLDINGCO_t + \beta_8 DEPOSIT_t + \beta_9 LOANHC_t + \beta_{10} FVDIFF_t + \varepsilon_t. \quad (7)$$

	Coeff.	Chi-square
Intercept	53.814	4.28**
$EQUITYCAP_t$	−3.094	0.49
$LOAN\%_t$	6.000	9.93***
NPL_t	18.132	7.78***
$LIQUIDITY_t$	0.039	0.05
ROA_t	−0.116	0.71
$SIZE_t$	0.043	0.13
$HOLDINGCO_t$	−0.092	0.06
$DEPOSIT_t$	0.006	9.83***
$LOANHC_t$	−63.970	5.92**
$FVDIFF_t$	−0.601	0.01

Panel B: Ability of Historical Cost, Fair Value, and Tier 1 Capital Ratios to Predict Bank Failures

$$\Pr(FAIL2 = 1)_{t+1} = \alpha + \beta_1 LEVERAGE_t + \beta_2 NONACCRLOANS_t + \beta_3 PASTDUELOANS_t + \beta_4 OREO_t + \beta_5 ABSMATURITYGAP_t + \beta_6 ROA_t + \beta_7 SIZE_t + \varepsilon_t. \quad (8)$$

	FV *LEVERAGE*		GAAP *LEVERAGE*		TIER 1 *LEVERAGE*	
	Coeff.	Chi-Square	Coeff.	Chi-Square	Coeff.	Chi-Square
$LEVERAGE_t$	0.014	1.266	0.036	2.584	0.236	10.435***
$NONACCRLOANS_t$	0.490	47.386***	0.496	46.656***	0.495	33.498***
$PASTDUELOANS_t$	0.088	0.012	0.104	0.018	0.140	0.035
$OREO_t$	−0.283	1.431	−0.336	1.922	−0.523	3.624*
$ABSMATURITYGAP_t$	−0.769	0.436	−0.652	0.305	−0.250	0.044
ROA_t	−0.185	4.006**	−0.144	1.665	−0.053	0.134*
$SIZE_t$	0.102	1.120	0.078	0.593	0.041	0.160
n	3,584		3,584		3,584	
Pseudo R^2	0.259		0.262		0.293	

*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively.